Welding Engineer

PRICE 50 CENTS

OCTOBER, 1955

No. 602-3-C with #1085
Insulated Steel Glass Holder

No. 706-3-C with #1096
Insulated Dowmetal Lift-Front Glass Holder

FIBRE and FIBERGLAS* HELMETS

Inside view showing INNER BIB of Series "600" Helmets for extra protection to welder's neck from flashes and reflected glare.

New Series "400" Helmets. Smaller size for close quarter work.

*OWENS-CORNING TRADE MARK

Safety and comfort mean *more* welding . . . more production per day! Fibre-Metal engineering has for 50 years kept these "qualities" uppermost in mind . . . for more and better *work ability* by the welder.

Fibre-Metal's Helmets of Fibre *or* Fiberglas* are light, durably resistant to impact and hard use. They feature seamless compression-molded shells, beaded edges for strength and safety, Wide Range Headsize Adjustment, new 4-Position Helmet Stop, and provide for four popular glass holder styles. Adjustable friction joints hold helmet in any position.

Fibre-Metal Features:

LIGHT WEIGHT • EXCEPTIONAL STRENGTH • MOISTUREPROOF
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When buying any welding equipment . . .
always ask for a FIBRE-METAL product!

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PROFITABLE PROTECTIVE PRODUCTS SINCE 1905

WORKER SAFETY PAYS DIVIDENDS

THE WORLD'S LARGEST MANUFACTURER OF SUPERIOR PROTECTIVE EQUIPMENT

THE FIBRE-METAL PRODUCTS COMPANY
CHESTER, PENNA.

Sold Everywhere thru leading Distributors and Dealers

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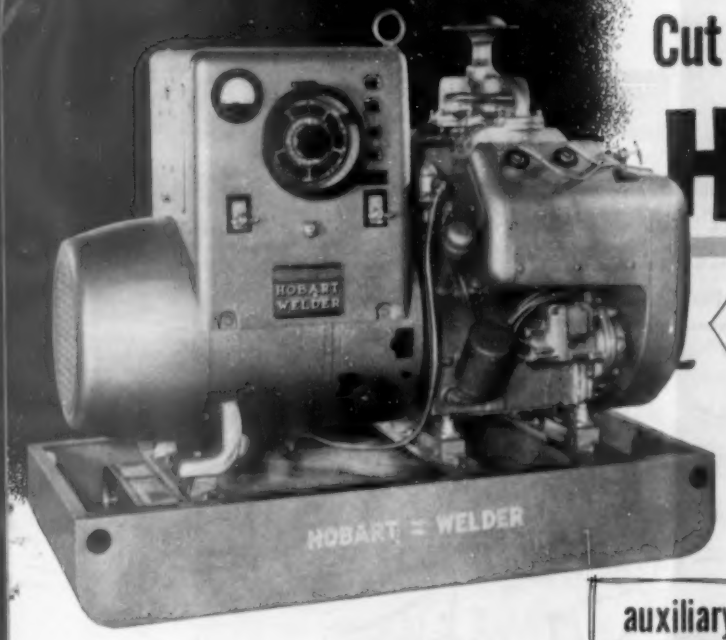
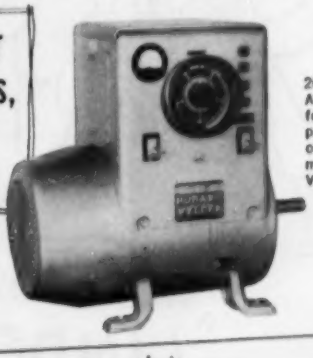


New, air cooled engine driven model

Get this 2 in 1 unit on the job so you can weld or have emergency 110/220 power any time, anywhere . . . your men can handle the "extra" jobs—saving you time and money. This rugged, compact and lightweight 200 amp. gas drive welder gets to the job easily and quickly—eliminating costly delays, expensive replacement parts and dismantling. It can be mounted on your truck or trailer or you can choose among several portable mountings.

auxiliary power for motors, tools, etc., plus arc welding



200 or 300 ampere AC power—AC welder for connecting to your own power source. Build your own unit by coupling this model direct, or by means of V belts and grooved pulley.

1. Welds!

Be independent of electric power lines . . . weld anywhere on a moment's notice.

2. Runs tools!

Actually doubles the value of present equipment by providing power when you want it—where you want it.

3. Lights!

110/220 power ready instantly to keep your work moving all the time.

4. Power pumps, paint sprays

. . . motors, tools, grinders, power saws, etc., instantly give you AC current up to 5 KW (5000 watts) to power equipment where no other power is available or as "stand-by" for emergency use in case of power failure.

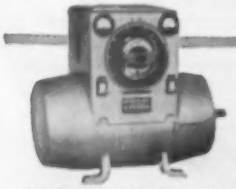
HOBART arc welding speeds up your work in PRODUCTION, MAINTENANCE, CONSTRUCTION and REPAIR

DC RECTIFIER 300 amp. Has three Delta connected transformers . . . magnetic line switch . . . overload protection, plus remote control.

TRANSFORMER WELDERS 180 to 500 amp. models for shops that have only single phase power available. Has a hot, fast, stable arc.

"HUSKY BOY" low investment, light-weight 200 amp. air cooled model for general shop and outside repair work. Easily mounts on truck or trailer. Portable mountings available.

ELECTRIC DRIVE 300 and 400 amp. welders ideal for production, maintenance and repair service. Conservative rating lets you do heavy duty welding for limited periods of time.



GENERATOR ONLY 200 or 300 amp. with 1 KW 110 volt DC power outlet. For "Building Your Own". Just couple direct or V belt it to a good gasoline engine.

"BANTAM CHAMP" 250 amp. welder specially designed for light to medium requirements. Popular for all fabrication purposes in the 200 to 250 amp. class.

"CONTRACTOR SPECIAL" A 250 amp. Gas Drive model that's light and compact . . . yet has plenty of engine power and a hot, fast, dependable arc.

GAS DRIVE WELDERS with 1 or 3 KW DC or 6 or 12 KW AC auxiliary power. 200 to 600 amp. models for speedy, low cost welding in the field where electric power is not available.

You'll Like HOBART Electrodes

Hobart's complete line of electrodes offers you a practical solution to every welding problem. You'll find a size and type best suited to meet your particular requirements. Write for our complete electrode catalog.

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HOBART BROTHERS CO., BOX U-105, Troy, O. Phone 21223

Without obligation, please send me complete details on the items checked: _____ amp. capacity.

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☐ Rectifier ☐ Transformers ☐ "Husky Boy"
☐ Electric Drives ☐ Generator Only ☐ Bantam Champ
☐ Contractor Special ☐ Gas Drives ☐ Electrode Catalog

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LINDE's new metal cutting process will change the entire economic picture of non-ferrous metal fabrication. Look for LINDE at the METAL SHOW and see a live demonstration of how you can slice through ¼-in. aluminum plate at *300 inches per minute*—leaving a saw-like cut—with this new cutting tool.

The term "LINDE" is a registered trade-mark of Union Carbide and Carbon Corporation.

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Welding Engineer

OCTOBER, 1955
Vol. 40—No. 10

A MAGAZINE OF JOINING AND SEVERING OF METALS

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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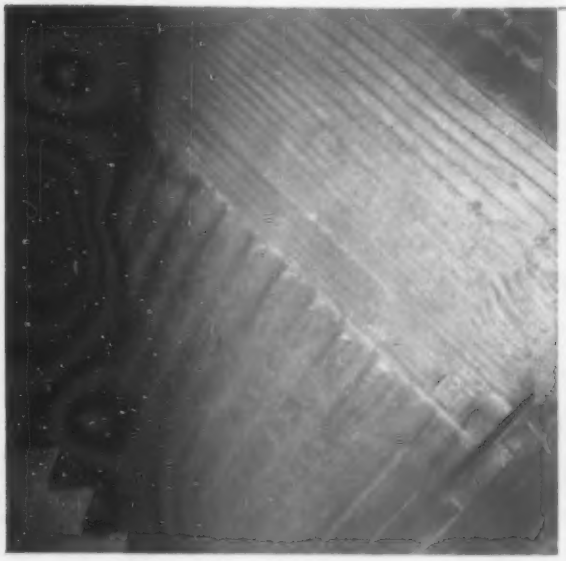
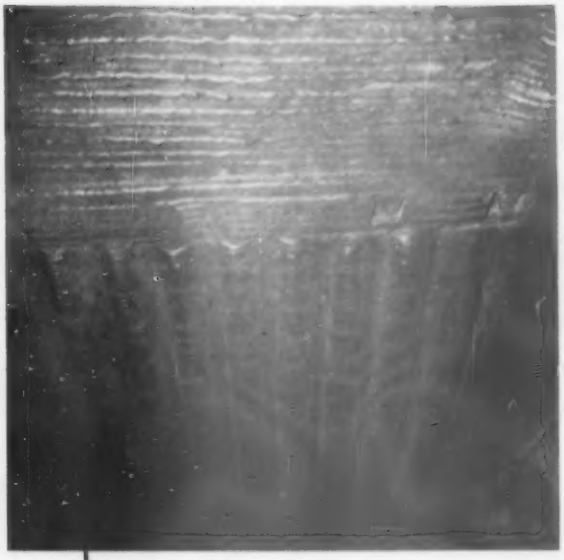




how to EXTEND working life of jaw crushers

apply VICTOR HARDFACING

No Disassembly This jaw crusher was hardfaced with jaws bolted in place, using 3/16″ coated Tube Victorite. Despite cramped working area only 12″ deep and 36″ wide, high deposition rate and low spatter loss enabled welder to get uniform, nonsagging, long-wearing bead without distorting jaw.

Downtime Saver Because it goes on fast, without flux interference, and sets up quickly, coated Tube Victorite is wonderful for hardfacing on the job without disassembly of equipment.

Where To Use Coated Tube Victorite is a high alloy content rod with Rockwell C hardness of 55-58. It was developed specifically for tools subject to severe abrasion and impact, such as:

- Ripper Teeth
- Pug Mill Augers
- Jaw Crushers
- Roll Crushers
- Die Rings
- Tool Joints
- Scraper Blades
- Asphalt Mixer Paddle Shanks
- Mill Hammers
- Bucket Lips

It welds easily to carbon alloy and manganese steels—the latter frequently is used for buildup before applying coated Tube Victorite. It can be used for position welding. Deposit is smooth, even, free of pin holes. Made for AC and DC (reverse polarity) application.

Free Help—Victor hardfacing manual shows you the right rod to use and how to apply it. Ask your Victor dealer for manual and descriptive leaflets on Tube Victorite and other Victor rods . . . or write us.

Profitable dealerships open; inquire now!

VICTOR for hardfacing

VICTOR EQUIPMENT COMPANY
ALLOY ROD & METAL DIVISION
Los Angeles 59, California • Wakita, Oklahoma

NATION'S newest primary aluminum producer is this $65,000,000 facility at Columbia Falls, Mont., near Hungry Horse Dam. Owned by Anaconda Aluminum Co., the first firm to enter the aluminum field since 1946, the reduction plant is expected to reach annual capacity of 120,000,000 lb by Jan. 1, 1956.

HOME office building planned in New York City will make extensive use of stainless steel. (See story below.)

News

Liquid Carbonic sells bottling machinery lines

Assets of the entire bottling machinery line of The Liquid Carbonic Corp., Chicago, have been split and sold to three bottling equipment manufacturers. The three transactions involve the sale of inventories, tooling, designs, and licenses to sell under patents and trade marks.

The three firms are the George J. Meyer Mfg. Co., Milwaukee; Barry-Wehmiller Machinery Co., St. Louis, Mo., and Crown Cork & Seal Co., Inc., Baltimore, Md. The move by Liquid Carbonic practically completes its plan to sell all product lines of its durable goods division in order to concentrate on its compressed gas operations.

* * *

Sperry Corp. merges with Remington Rand

Sperry Corp. recently merged with Remington Rand, Inc., to form the Sperry Rand Corp., New York City.

* * *

Another U. S. helium plant planned at Exell, Texas

Construction of a $6,000,000 helium-producing plant at Exell, Texas, is planned by the U.S. Government. The Texas location, already the site of a helium plant of the Bureau of Mines, was chosen after consideration of a tract near Keyes, Okla. A spokesman for the Interior Department, which recently requested construction bids, hoped an additional plant would be built at Exell to take further advantage of the helium-bearing gas in that region.

The new plant will have a rated capacity of 100,000,000 cu ft of helium a year. As a result, Government production of helium is expected to increase approximately 50%.

* * *

Holiday Plastics buys Thermacote Welding

Thermacote Welding Products, Inc., of Newark, N. J., and of Los Angeles has been consolidated as a subsidiary of Holiday Plastics, Inc., Kansas City, Mo.

George K. Frischer has been named president of the overall operation. Robert Vaillancourt remains president of Thermacote Division and Richard Vaillancourt, vice-president in charge of sales. C. W. Niederauer also remains general manager of the division.

The consolidation provides increased facilities for the sale and manufacture of welding products.

Union Carbide plans new home office

Union Carbide & Carbon Corp., New York City, has announced plans to build a 41-story building on the area bounded by Park and Madison Avenues, and 47th and 48th Streets, in that city. The new building will house the home offices of the corporation, its divisions and subsidiaries. It is planned for completion in 1958.

* * *

Ross Valve starts pneumatic publication

The first issue of the *Ross Enginair*, devoted to the field of pneumatic power, has been published by Ross Operating Valve Co., Detroit. The publication will feature application stories as well as discussing the fundamentals of pneumatics in a series of primer articles.

Automation usage of air pressure will also be covered. Included will be a digest of current trade journal articles. The magazine is available from Ross sales and service representatives. It will appear bi-monthly.

* * *

Five new firms join IAA

Five firms were recently elected company members of the International Acetylene Association, New York City. They are: American Cyanamid Co., New Orleans; The Burdett Oxygen Co. of California, Huntington Park, Calif.; Coyne Cylinder Co., San Francisco; The Dow Chemical Co., Freeport, Texas; Teikoku Sanso, K. K., Kobe, Japan.

NEWS

from page 5

RESEARCH center is completely equipped for improvement and development of electrodes and weld metal. (See story below.)

WELDING exhibit was feature of steel plant's 75th anniversary celebration. (See story below.)

Alloy Rods opens new research lab

A new research and development center has been opened by Alloy Rods Co. adjacent to its general offices and plant at York, Pa. Facilities include chemical, physical testing and welding laboratories, as well as a complete machine shop and an experimental mixing and extrusion department.

All departments have modern equipment for the development and improvement of electrodes and weld metal. The new center will be devoted to product research and quality control.

* * *

Annual Safety Congress in Chicago this month

Chicago will again be the site of the annual National Safety Congress, which this year will be held Oct. 17 through 21.

Congress headquarters will be at the Conrad Hilton Hotel. Last year, about 12,000 persons attended the safety show and talks.

* * *

Walworth Co. purchases Texas welding firm

Southwest Fabricating & Welding Co., Inc., Houston, a pipe fabricating firm, has been acquired by the Walworth Co., New York City. The firm will operate as a subsidiary, retaining present management.

* * *

Porter acquires Joliet electronics firm

The Electric Service Engineering Co., Joliet, Ill., has been acquired by H. K. Porter Co., Inc., New York City. It will be known as the Eseco Division and becomes the 13th within the Porter organization. Eseco manufactures electrical and electronic devices used in heavy industry. There will be no change in management.

* * *

Crane Co. celebrates centennial year

A century of achievement is being celebrated this year by Crane Co., Chicago, world's largest manufacturer of valves and fittings and producer of kitchen, bathroom and heating equipment.

The firm was founded in 1855 by Richard Teller Crane. First called R. T. Crane Brass and Bell Foundry, the firm produced brass couplings and copper tips for lightning rods. Crane Co. has lately entered the field of aircraft accessory equipment.

* * *

Square D builds new Michigan plant

Square D Co., Detroit, has begun construction of a new plant at Royal Oak, Mich.

* * *

Harrisburg Steel buys Precision Castings

Harrisburg Steel Corp., Harrisburg, Pa., has purchased Precision Castings Co., Niles, Ill. Precision will function as a division of Harrisburg. It will expand its facilities, initiate plant improvements and broaden its engineering, design and sales forces. Precision Castings is a manufacturer of aluminum, zinc and magnesium die castings.

Diamond jubilee marked by South Chicago Works

The United States Steel Corp.'s South Works, located on South Chicago's lakefront, celebrated its 75th anniversary during the latter part of August.

The diamond jubilee was marked by a "family day" during which thousands of persons toured the steel plant. Previously, a luncheon attended by many dignitaries, including Illinois Governor William Stratton and junior Senator E. M. Dirksen, was held at the South Shore Country Club.

Special guests at the luncheon celebration were 28 men who have served U. S. Steel for 50 years or more.

Founded in 1880, the South Works employs 14,000 persons and is the oldest steel mill in Chicago and the third largest in the world. During its 75 years, the mill has turned out enough steel for 60,000,000 autos.

* * *

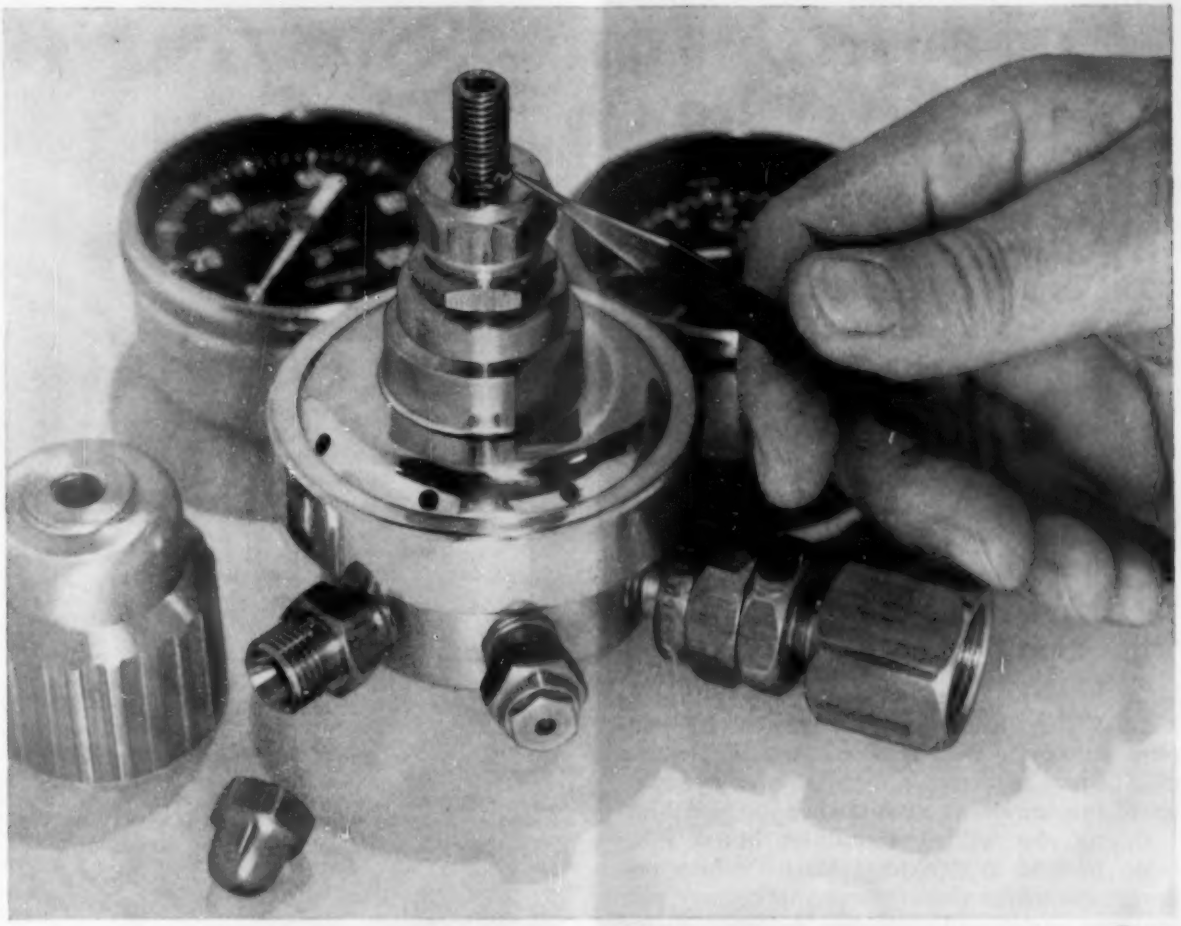
Have you felt the steel shortage?

As this issue of WELDING ENGINEER went to press, more than just a few painful moans were heard from those being pinched by the steel shortage.

In the Midwest, for example, officials of steel-supply companies were saying that they could sell from 30 to 50% more steel—*if* they had it. In that general area, the shortage was blamed primarily on the fact that the normal summer drop in demand never materialized.

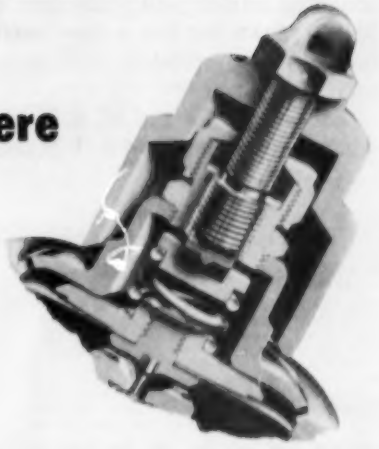
On the contrary, there was an un-

(Continued on page 100)



sealed in smoothness . . .
neither dirt nor trouble can enter here

Tension screw wear and sticking is a sign of poor design and inadequate manufacture—it is not necessary for you or your operator to struggle with regulator tension screw adjustment. The answer to this problem is simple—*keep foreign matter out of the threaded parts.* This tension screw is fully protected by a unique packing and a special type of friction bushing. Just try this regulator tension screw—adjust it yourself and feel how smoothly it works; you can reach maximum delivery pressure effortlessly.



this is the inside story of a wonderful improvement in tension screw design and action. No other regulator has this patented feature . . .

National of California

NATIONAL welding equipment company... 218 fremont street san francisco 5 california

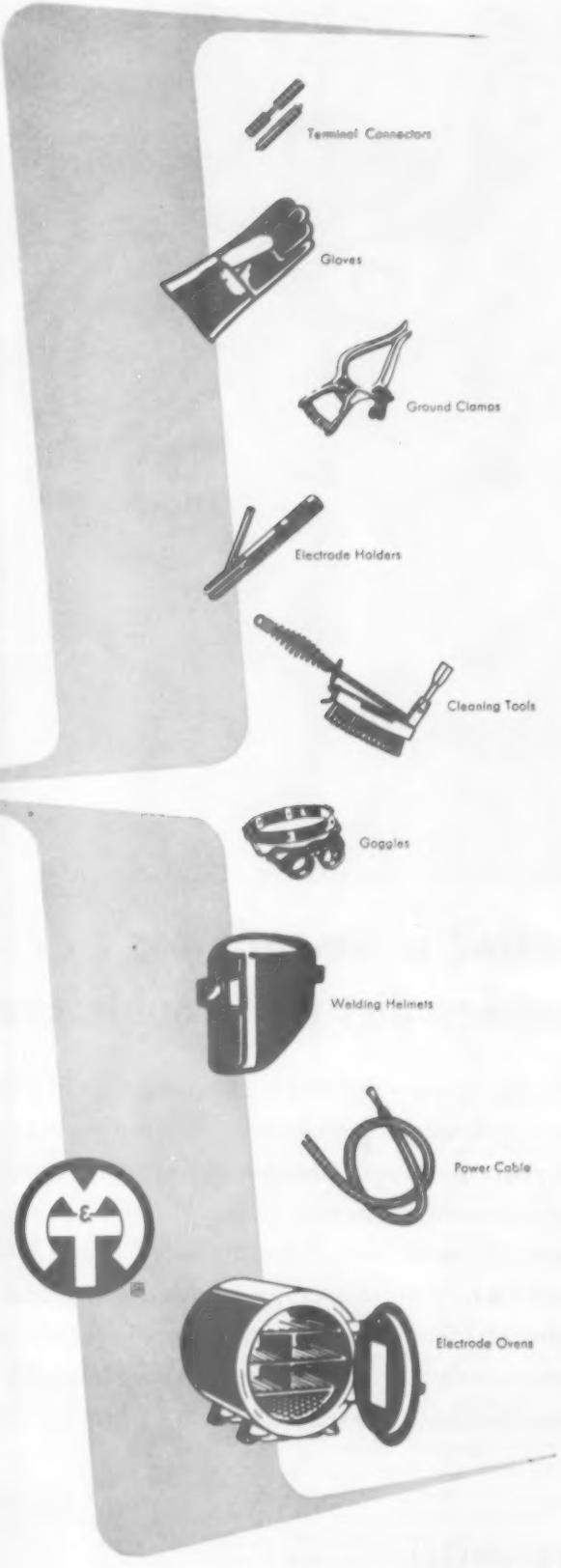
524

FROM CONNECTORS TO OVENS . . . . . .

Metal & Thermit and its distributors carry a complete line of arc welding accessories. Selected for their quality, and stocked for your buying convenience, they are always on hand when you need them.

Buying your welding accessories, Murex Electrodes, and M & T Welding Machines from one dependable source assures you prompt delivery, personalized service, and purchasing economy. Buying M & T down the line is good safety insurance too, because every product has been field tested to serve you well.

For a copy of the M & T accessories catalog contact your nearest M & T branch office, or write.



METAL & THERMIT CORPORATION • WELDING DEPARTMENT • 100 EAST 42ND STREET, NEW YORK 17, N. Y.

Originators not Imitators

"Every kind of imitation speaks the person that imitates as inferior to him whom he imitates, as the copy is to the original."

LORD SOUTH

R. D. WASSERMAN

In every age, in welding and every other industry, you will always find those whose only claim to fame for their product is that it is "just as good."

More than 50 years ago, J. P. H. Wasserman, a Swiss metallurgist, pioneered a new welding process. He blazed a trail that others have tried to follow. Relentless research following his discovery has perfected Eutectic's "Low Heat Input" metal joining process which provides the high strengths of fusion welding using the lower heats associated with brazing.

Eutectic's research has never been equalled. Very simply, that is why no welding material imitating Eutectic "Low Temperature Welding Alloys"® can be "just as good" or produce equal results and savings.

Year after year, "Eutectic" has originated new and ever better welding alloys to make the weldor's job easier and more profitable. The rapidly increasing preference for Eutectic "Low Temperature Welding Alloys" in over 87,000 American industries is proof of Eutectic's leadership. It is testimony that the American weldor is too smart to be fooled by imitations. The American weldor realizes the importance of getting all the advantages of Eutectic's "Low Heat Input" metal joining process—the elimination or minimization of overheating, warping, distortion, embrittlement and other dangers to base metals.

To the weldor, Eutectic's process means "Better, Faster, Cheaper" welding. To industry everywhere, "Eutectic" has made welding more profitable, with an ever-widening field of application for production, maintenance, and salvage of metals and metal products.

A FEW "EUTECTIC" FIRSTS

1940-1955

- U.S. Patent #2,583,163. Surface alloying process for bonding metals.
- U.S. Patent #2,288,869. First Torch Alloy for joining cast iron with color match, without fusion.
- U. S. Patents #2,359,813, #2,410,850, #2,544,000. First metallic film coating to enhance Surface Alloying.
- U. S. Patents #2,279,282, #2,279,283, #2,279,284. First nickel bearing copper alloy for high tensile joining.
- U.S. Patent #2,481,053. First torch alloy and flux for joining high aluminum content metals.
- U.S. Patent #2,471,803. First "Low Amp" coating for metal arc welding of cast iron.
- U.S. Patent #2,632,000. First low-melting electrode for high tensile strength joining of aluminum.
- U.S. Patent #2,632,835. First "Low Amp" electrode coating for high alloy steels.
- U.S. Patent #2,626,339. First electrode for high tensile strength joining of copper.

RESEARCH—BACKBONE OF PROGRESS

During the past 50 years Eutectic Welding Alloys Corporation has learned much. It is possible for imitators to analyze our welding rods, electrodes and fluxes. But originating and producing them is an achievement only "Eutectic" can claim. Only the long, hard road of doing it can provide the answers.

The time spent in imitation is lost, for long before a "copy" can be made, Eutectic's research has perfected other new and improved materials.

Today, in Eutectic's own research centers throughout the world, teams of metal experts create and test newer and better products for metal joining. And, in its own up-to-the-minute plants, meeting rigid standards of quality, "Eutectic" turns these research products into "Low Temp" EutecRods and "Low Amp" EutecTrodes that bring the benefits of "Low Heat Input" metal joining into shops everywhere.

ORIGINATORS NOT IMITATORS

The research behind this phrase is your assurance of the most modern welding materials known. It is your assurance that you are applying advanced "Low Heat Input" metal joining techniques to your critical work and that you have the most modern developments at your fingertips.

Don't be fooled by those who tell you that any ordinary rod or electrode is "just as good." Nothing can match Eutectic "Low Temperature Welding Alloys" performance.

Remember, it is the quality of the finished job and the ease and speed with which you do it that determines real economy, and not a few pennies difference in original cost. Because of its research facilities, only Eutectic Welding Alloys Corporation gives you true "Low Heat Input" metal joining and helps you eliminate the risks of dangerous overheat overheating and the subsequent distortion and damage to base metals. And that, after all, is what you are always after.

READY TO PROVE WHAT WE SAY

To bring you all the benefits of Eutectic's research, our District Engineers are ready to go right into your shop to show you how Eutectic "Low Temperature Welding Alloys" will solve your welding problems. Your Eutectic District Engineer will show you how the same electrode holder or torch you use with conventional materials gives you "Better, Faster, Cheaper" welds with "Low Temp" EutecRods and "Low Amp" EutecTrodes . . . with substantial savings in work, time, gas and welding materials.

YARDSTICK OF PERFORMANCE

To help you select from among the more than 160 EutecRods and EutecTrodes those that will give you largest savings per job, write for your free copy of our new 32-page DirectoRod Guide. Whatever your welding problem—production, maintenance or salvage, there's a EutecRod or EutecTrode to do the job faster, better, and cheaper. Use the convenient coupon below.

SYMBOLS OF DEDICATION

These seals denote our proud contribution to American industry: 15 Years of "Golden" Savings, 50 Years of Research. These years have seen many great achievements. And, for the future, we look forward to ceaseless weldgineering and the continued application of Eutectic's research to your service.

R. Wasserman

President, Founder, Director of Research

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Please send your new DirectoRod Guide.

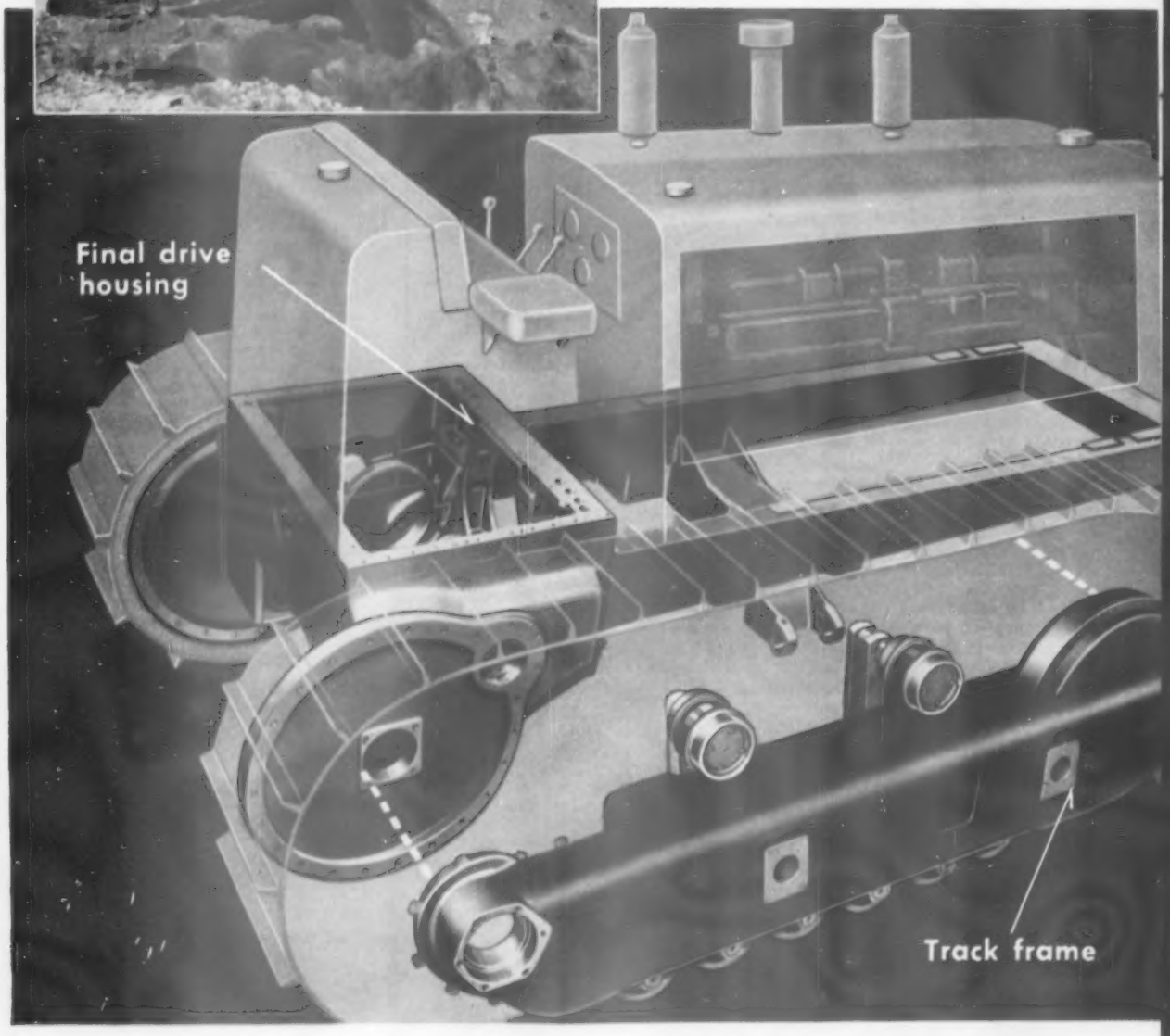
Name.....

Company.....

Company Address.....

City..... State.....

Here, welds push.



FIRM FOUNDATION FOR PROFITABLE DIRTMOVING — All these critical parts of the 42,112-lb. TD-24 are welded with A. O. Smith SW-12 electrodes: final drive housing that protects vital transmission and steering gear . . . front support frame that anchors the hauling drawbar and serves as the base for bulldozer attachments . . . welded one-piece track frames, two sure-footed foundations for crawler mobility on all kinds of terrain.

must withstand tons of continuous

pull, smash, squeeze

they're made with A. O. Smith electrodes on the final drive housing, front support frame and track frames of the famous, productive

INTERNATIONAL TD-24 DIESEL CRAWLER

A GIANT in terms of both power and performance, the TD-24 has racked up hundreds of success stories. The unit rates as the "BOSS TRACTOR" wherever it works — hauling huge scrapers, bulldozing, grading. Tons are "toys" for the TD-24.

A. O. Smith SW-12 (AWS E-6012) electrodes account for more than half of over 600 lbs. weld-rod used in each TD-24. These electrodes are used to make many of the critical welds.

All first-pass stringer welds on the final drive housing, front support frame and track frames are made with SW-12's. This is where strength pays off. This is where welds must withstand severe impact, tremendous thrust, continuous extremes of punishment.

When it comes to choosing the right electrode for your work, it's just good business to see A. O. Smith first. Remember, we give you everything else for welding, too—a-c and d-c welding machines, a complete selection of electrodes, equipment, accessories. For full information, see the representative who calls on you . . . or write A. O. Smith Corporation, Welding Products Division, Milwaukee 1, Wisconsin.

The man from A. O. Smith...
Owen Lundgreen is the representative who helped International Harvester select SW-12 electrodes for the TD-24. Not just an electrode salesman — but a real welding consultant — your man from A. O. Smith is always available to help solve your welding problems.

Through research A.O. Smith *... a better way*

A.O.Smith
CORPORATION

WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin
International Division: Milwaukee 1, Wisconsin

TERRIFIC HEAT !

HARRIS SUPER-HEAT TORCH NO. K23

Heat is the Prime Factor utilized in connection with innumerable Metal Working Operations. While it is a fact that the Oxy-Acetylene Welding Torch is universal in its applications, there are many Operations requiring a much greater volume of Intense Heat than can be obtained from a Welding Torch.

A definite limitation exists relative to the amount of Oxygen and Acetylene Gases which can be safely mixed without danger of the Flame "Back-firing", due to the extremely fast Flame Propagation Characteristics of such Gas Mixtures. On the other hand, much larger volumes of such Fuel Gases as Propane, City Gas and Natural Gases can be safely mixed with Oxygen on account of their lower rate of Flame Propagation. It is evident the larger the volume of Gases mixed, the greater the Flame and resulting Heating Value. This produces the truly phenomenal results achieved by this Harris Super-Heating Torch.

The applications of this Harris Torch are unlimited, where large volumes of Intense Heat are required, either as a Portable or Stationary Unit. In places where Massive Shafts are to be Straightened; Large Size Pipe Bent; Flanging or Straightening of Steel Plates; Brazing Heavy Copper Pipe, etc., etc., this Harris Torch, with its **TERRIFIC HEAT**, is the answer.

HARRIS 1903 50 1953 ANNIVERSARY

SEND FOR DESCRIPTIVE FOLDER NO. 540710

THE HARRIS CALORIFIC COMPANY
CLEVELAND 2, OHIO

How to use
New USS "T-1" Steel
to reduce welding costs

New USS "T-1" Steel is three times as strong as ordinary mild steel . . . has a yield strength of 90,000 psi.

Yet, despite its very high strength, this new alloy steel is *easy to weld*. It requires neither pre- nor post-heating when you weld or flame cut it. You can use its unique combination of properties to reduce fabricating costs and speed assembly in pressure vessels, construction machinery, mining equipment, bridges, towers, and pipe.

USE "T-1" TO REDUCE THICKNESS. You can take advantage of the exceptionally high yield strength of "T-1" Steel to reduce the size and weight of heavily stressed parts. Weldments on thinner sections take less time . . . and less welding rod.

FABRICATE "T-1" IN THE FIELD. You can weld "T-1" Steel *anywhere*. Since no pre- or post-heating is needed, you don't have to confine fabrication to locations where heat treating facilities are available. You can assemble heavy-duty equipment in the field, and you can repair it in the field—at great savings.

WHAT ABOUT JOINT EFFICIENCY? Weldments in "T-1" Steel develop the full yield strength of the steel — 90,000 psi.—when made with AWS E12015 low hydrogen coated electrodes *without* pre- or post-heating. As a result, weight reducing designs based on the greater strength of "T-1" Steel are completely safe and reliable.

Send the coupon for complete facts about this amazing new alloy steel.

United States Steel, Room 4974
525 William Penn Place, Pittsburgh 30, Pa.

☐ Please send me your booklet "United States Steel presents T-1" which contains the full story of "T-1" steel.

☐ Have your representative get in touch with me.

Name .....

Address .....

City ..... State .....

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS "T-1" CONSTRUCTIONAL ALLOY STEEL

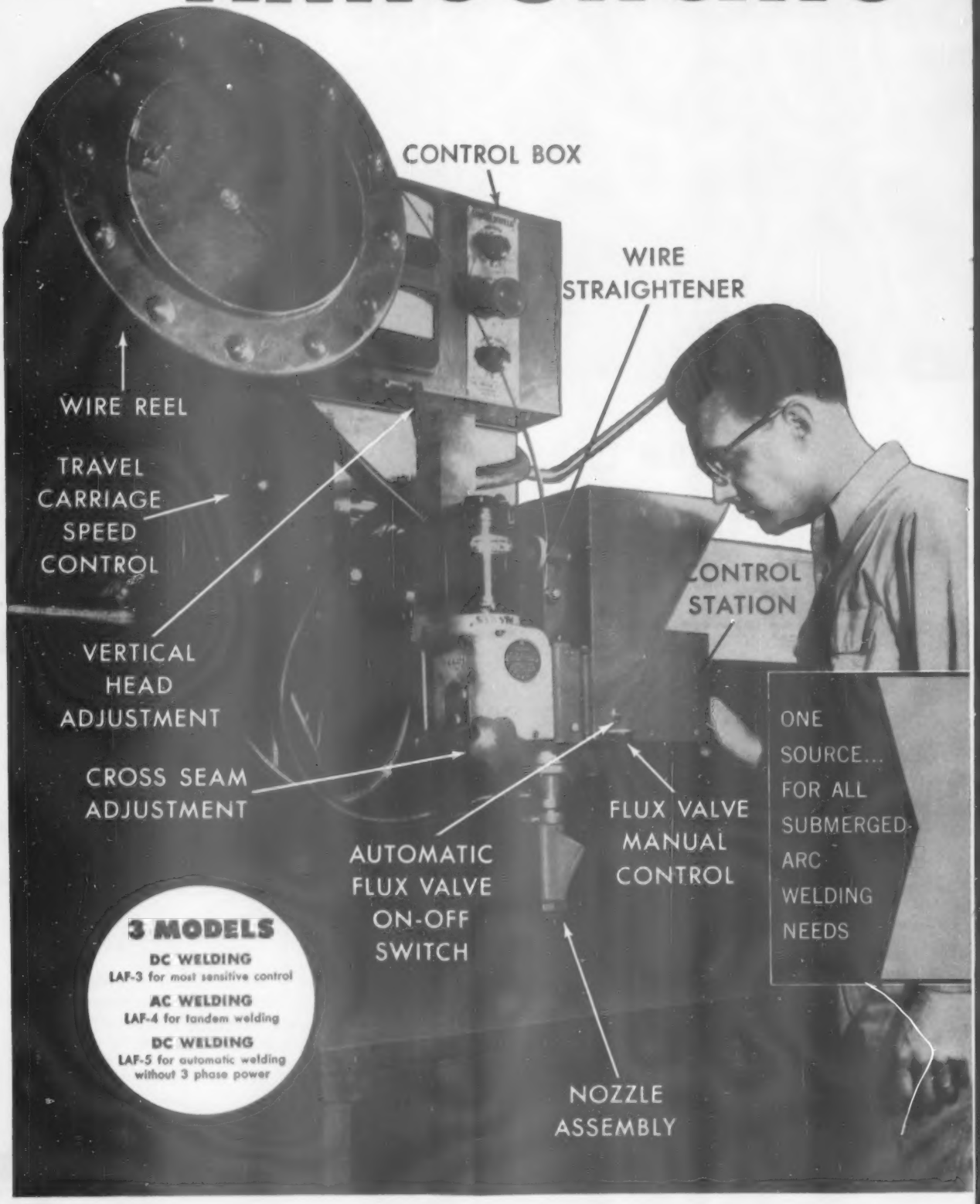
SEE THE UNITED STATES STEEL HOUR. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

USS

5-477

UNITED STATES STEEL

ANNOUNCING


CONTROL BOX
WIRE STRAIGHTENER
WIRE REEL
TRAVEL CARRIAGE SPEED CONTROL
VERTICAL HEAD ADJUSTMENT
CONTROL STATION
CROSS SEAM ADJUSTMENT
AUTOMATIC FLUX VALVE ON-OFF SWITCH
FLUX VALVE MANUAL CONTROL
ONE SOURCE... FOR ALL SUBMERGED-ARC WELDING NEEDS
3 MODELS
DC WELDING
LAF-3 for most sensitive control
AC WELDING
LAF-4 for tandem welding
DC WELDING
LAF-5 for automatic welding without 3 phase power
NOZZLE ASSEMBLY

A NEW LINE

of automatic WELDERS and POWER SOURCES for submerged-arc welding

LINCOLNWELD now gives you

- AC or DC welding current
- Motor-generator or rectifier for DC welding
- Variable voltage or constant potential generator

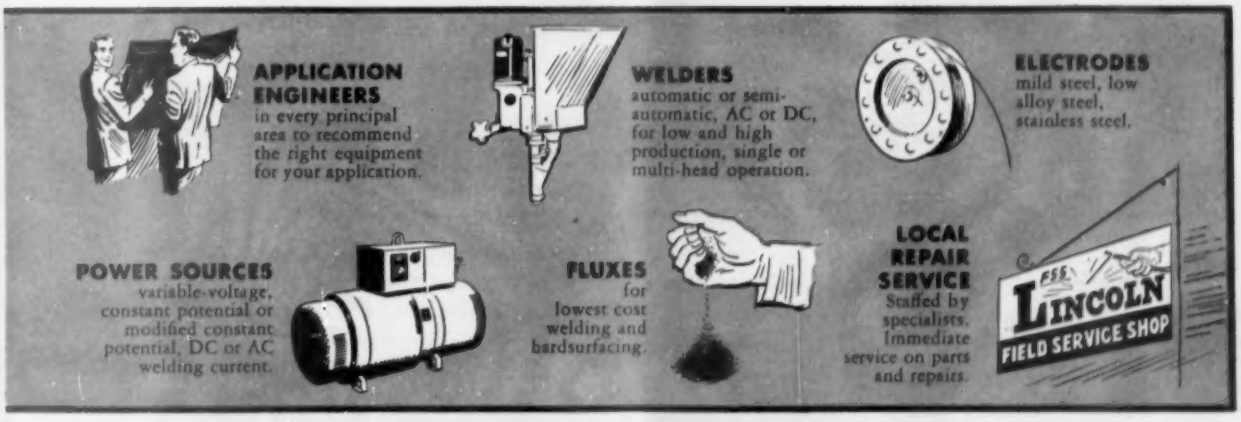
PLUS

Choice of Cold Starts or Hot Starts

Choice of Stand-still Start or Flying Start

Variable inching speed to or away from work

Automatic flux control


APPLICATION ENGINEERS
in every principal area to recommend the right equipment for your application.
WELDERS
automatic or semi-automatic, AC or DC, for low and high production, single or multi-head operation.
ELECTRODES
mild steel, low alloy steel, stainless steel.
POWER SOURCES
variable-voltage, constant potential or modified constant potential, DC or AC welding current.
FLUXES
for lowest cost welding and hardsurfacing.
LOCAL REPAIR SERVICE
Staffed by specialists. Immediate service on parts and repairs.
LINCOLN
FIELD SERVICE SHOP

SEE IT DEMONSTRATED AT THE METAL SHOW

October 17-21... Lincoln Booth 231 in Philadelphia

Write for Bulletin 1355 giving complete facts.

THE LINCOLN ELECTRIC COMPANY

Dept. 1709 • Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

FIR TREES FOR ACETYLENE CYLINDERS?

The inside story of the superiority of Norris-Thermador Acetylene Cylinders is the *charcoal* type monolithic filler. The *charcoal* used as one of the filler components comes from selected Washington fir of a very special quality. The trees used are those grown at a certain altitude, and must be of a specific age, height and diameter of limb. This special *charcoal*, manufactured under controlled processing conditions, must always conform to rigid Norris-Thermador standards—both as to the type of wood itself and size of granule. It combines perfectly with the other filler components of diatomaceous earth, asbestos and cement to provide a filler which holds more gas and hugs the inside cylinder wall to assure better welding jobs and greater safety.

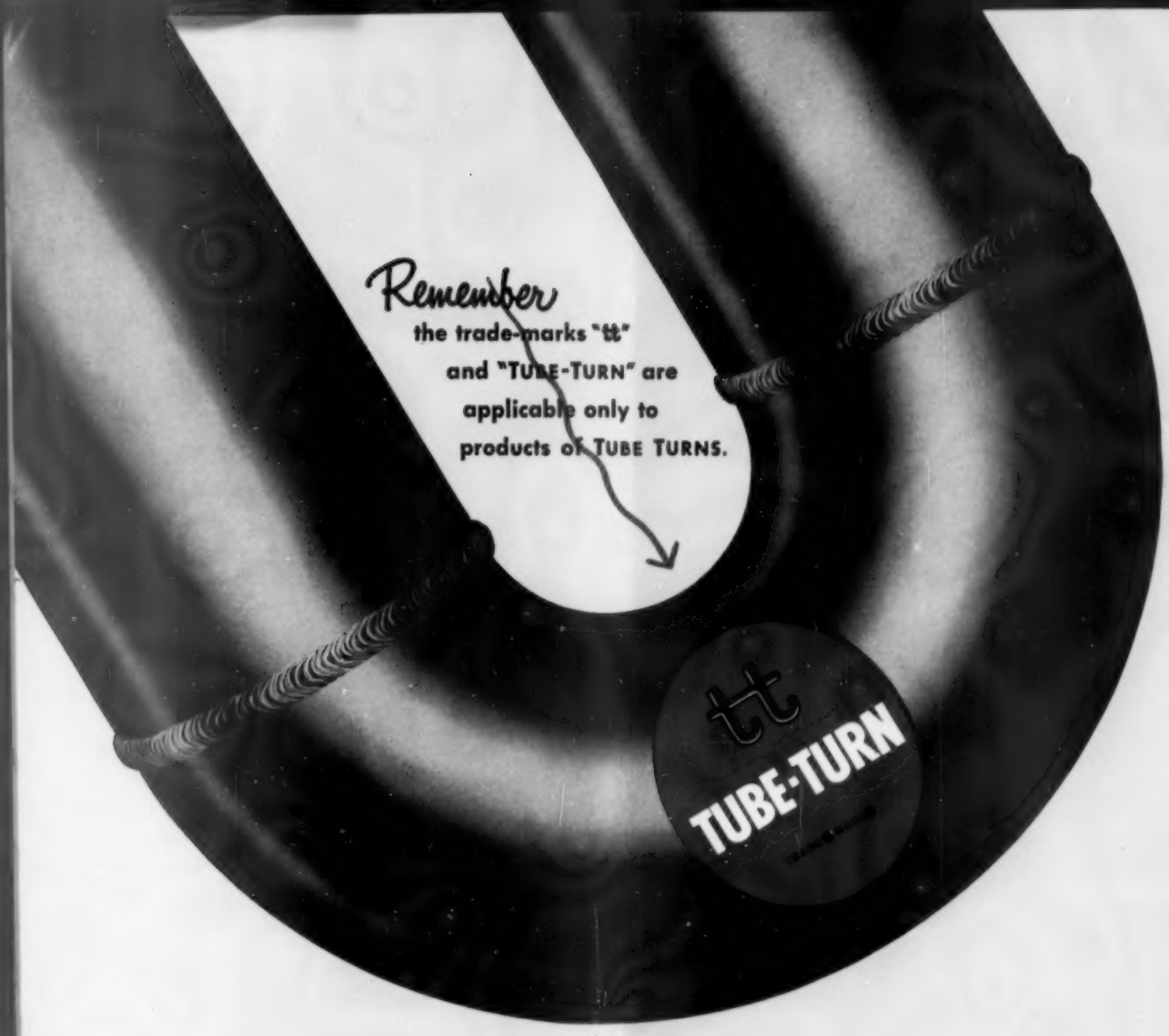
OTHER EXTRA VALUES. Check them: Cold-drawn construction . . . light-weight for easy handling . . . bases curled *under* for maximum strength and compact storage . . . larger cap holes—tags easily read without removing caps . . . all welding X-ray controlled . . . specification ICC 8 met and exceeded.

Acetylene cylinders from 10 to 300 cubic feet capacity.
Write or wire for specifications on all sizes. Cable: Northerm

NORRIS-THERMADOR
CORPORATION
5215 South Boyle Avenue, Los Angeles 58, California. Dept. WE-1055

"SEVEN LEAGUES AHEAD"

3-10378



Specify "TUBE-TURN" and you know you're right

THIS TUBE-TURN* Welding Return has a bursting strength at least equal to that calculated for the seamless pipe with which it is recommended for use. Made in U.S.A., it meets all American Standard and Safety Code requirements. Welders everywhere know it will line up perfectly . . . because it's forged by the only process that produces a wall with the maximum uniformity of thickness and circularity. In short, when you specify "TUBE-TURN" you *know* you're right.

Your nearby Tube Turns' Distributor is at your service. He can simplify your planning, meet your requirements exactly, with industry's most complete line of welding fittings and flanges.

TUBE-TURN Welding Fittings and Flanges are made in U.S.A.
They meet *all* U.S. piping code specifications.

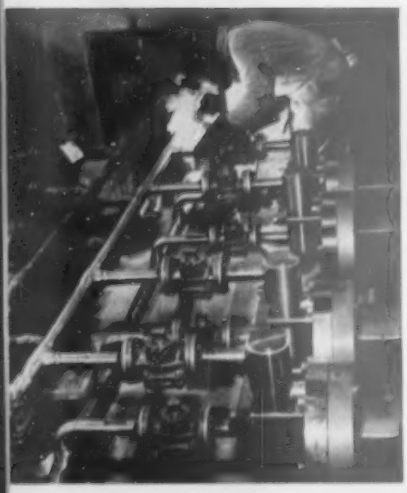
*"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Chicago • Kansas City • Denver
Los Angeles • San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

PIPING HELP



How TUBE TURNS' SERVICE can help simplify your piping jobs

1 ENGINEERING SERVICE

This unique press squeezes old automobiles into bales of metal to expedite scrap recovery. Designers of the press called on Tube Turns' Engineering Service for assistance in laying out the piping for the hydraulic system. Result—efficient, leakproof piping that enables the press to do its job on a two-minute cycle. Tube Turns' unmatched piping experience can help *you* when you have an out-of-the ordinary piping problem.

2 COMPLETE SELECTION

Here is a stainless steel nitric acid header using TUBE-TURN* Welding Fittings and Flanges for directional changes and valve connections. Stainless steel piping can provide long, safe service where corrosive gases or fluids are handled, or where temperature extremes are encountered. You can select TUBE-TURN Welding Fittings and Flanges in carbon steel, stainless steel, non ferrous metals and alloys, and in the schedules and sizes you need. Tube Turns offers industry's broadest line of welding fittings and flanges, covering over 4000 items.

3 FAST SERVICE

You expect a manufacturer to exercise strict quality control over his production—what about distribution of his products? Here again Tube Turns offers you outstanding service. Tube Turns selects *leading* distributors who maintain local stocks, are geared for fast service, and rate "A" for dependability. You can save purchasing time and inventory trouble when you work closely with your Tube Turns' Distributor. You'll find one in every principal city.

TUBE TURNS, Dept. N-5
224 East Broadway, Louisville 1, Kentucky
Please send bulletin on "Pipe and Fittings Material".

Company Name _____

Company Address _____

City _____ *Zone* _____ *State* _____

Your Name _____

Position _____

DISTRICT OFFICES:

New York	San Francisco
Philadelphia	Seattle
Pittsburgh	Atlanta
Cleveland	Tulsa
Detroit	Houston
Chicago	Kansas City
Denver	Dallas
Los Angeles	Midland, Texas

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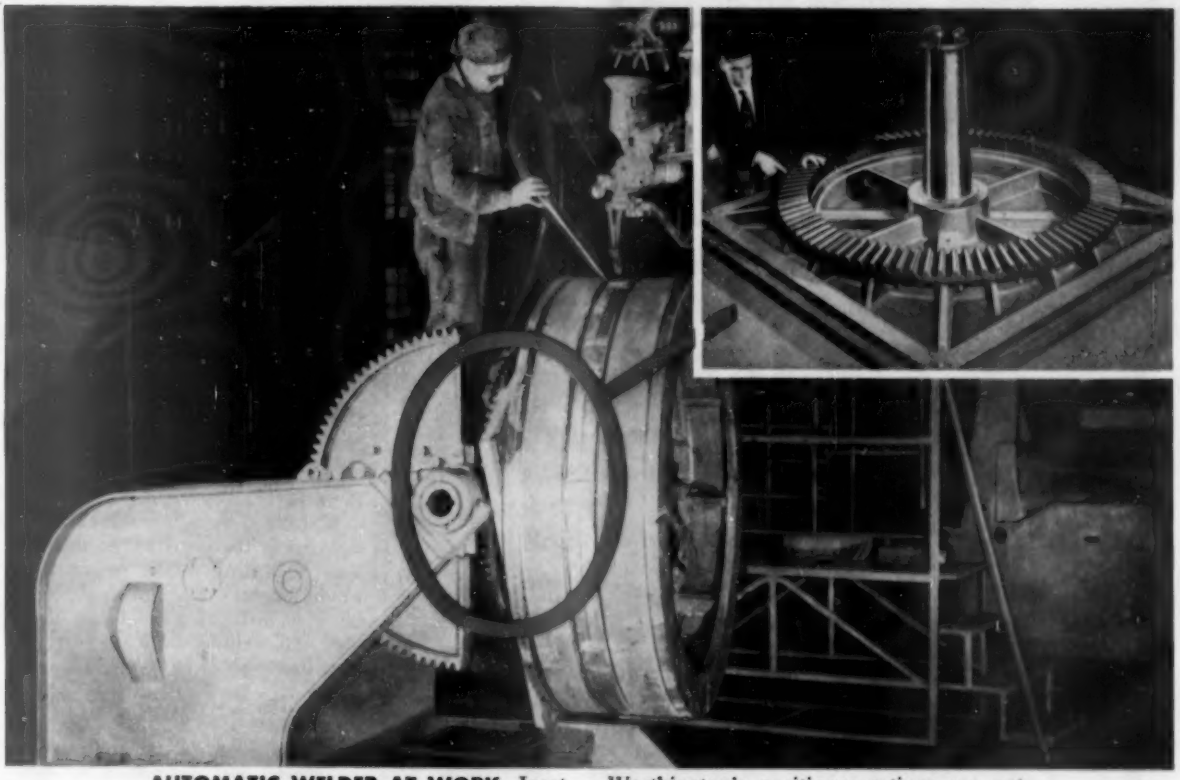
TUBE TURNS

A DIVISION OF NATIONAL CYLINDER GAS COMPANY
LOUISVILLE 1, KENTUCKY



AUTOMATIC WELDER AT WORK. Inset shows extra-large spindle and rugged bull gear of Worthington Welding Positioner, rated at 24,000 pounds, continuous duty. Worthington's positioner ratings are not just a by-product of the design. Rather, they are the result of extensive tests in laboratory and field.

Double-check welding positioner ratings!

— *don't underestimate their importance*

FREE New Bulletin R-1700-B15 shows you how to choose a positioner. It answers the seven basic questions you should ask before you buy *any* positioning equipment.

In positioners, as in all Worthington products, ratings resu'* from extensive tests in the laboratory and on the job.

Here are two steps that we take to assure you that every Worthington positioner rating is a *job* rating:

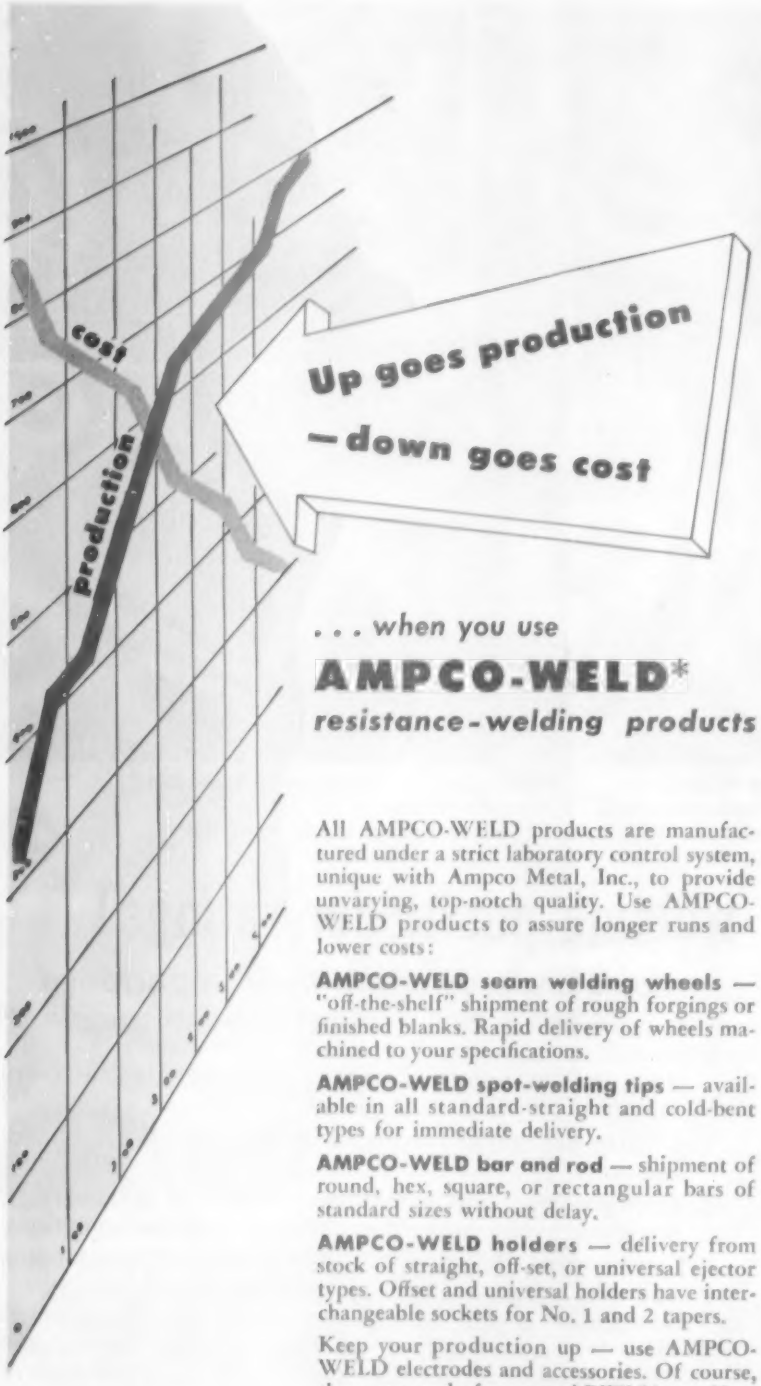
1. Each model is proved on the job before marketing as a standard unit.
2. Each positioner part, including motors, gears, and bearings, is selected to give you extra capacity for overload conditions.

Extra capacity, honestly rated, is typical of *all* Worthington Positioners — from smallest to largest, rated up to 50 tons.

No matter what your size requirements, there's a Worthington Welding Positioner for your job. Like all other Worthington products, its rating is backed by the integrity and reputation of 114 years of engineering experience. That's why you can rate our ratings as "conservative." Write for new Bulletin. Worthington Corporation, Harrison, New Jersey. Y-59

WORTHINGTON

Welding Positioners • Turning Rolls



. . . when you use

AMPCO-WELD*

resistance-welding products

All AMPCO-WELD products are manufactured under a strict laboratory control system, unique with Ampco Metal, Inc., to provide unvarying, top-notch quality. Use AMPCO-WELD products to assure longer runs and lower costs:

AMPCO-WELD seam welding wheels — "off-the-shelf" shipment of rough forgings or finished blanks. Rapid delivery of wheels machined to your specifications.

AMPCO-WELD spot-welding tips — available in all standard-straight and cold-bent types for immediate delivery.

AMPCO-WELD bar and rod — shipment of round, hex, square, or rectangular bars of standard sizes without delay.

AMPCO-WELD holders — delivery from stock of straight, off-set, or universal ejector types. Offset and universal holders have interchangeable sockets for No. 1 and 2 tapers.

Keep your production up — use AMPCO-WELD electrodes and accessories. Of course, they meet and often exceed RWMA specifications. Start specifying these dependable products today. Contact your AMPCO-WELD Distributor or write for bulletin.

*Reg. U. S. Pat. Off.

AMPCO®

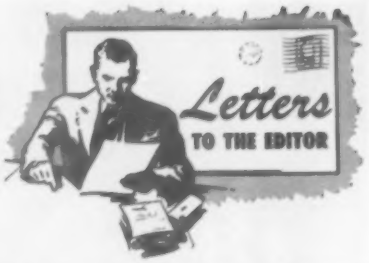
Sole Producer of Genuine Ampco Metal

AMPCO METAL, INC.

Dept. WE-10, Milwaukee 46, Wisconsin

West Coast Plant: BURBANK, CALIFORNIA

RW-16



Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if you request.

Plastic welding

Dear Sir:

We are very much interested in the article on page 42 in the July issue regarding plastic welding. We would be very happy if you would favor us with all available information and welding data on this subject, including prices.

R. W. Perkins
The Delco Welding Co.

—Mr. Perkins is speaking of "Plastic welding comes of age," p. 42, WELDING ENGINEER, July, 1955, by J. A. Neumann, president of American Agile Corp. He has been referred to Mr. Neumann.

* * *

June data sheet

Dear Sir:

Would you please send us a few tear sheets, your Data Sheet No. 177 (June, 1955, issue of WELDING ENGINEER) entitled "How to figure diameter and length of brazing wire."

F. K. Newcombe
Cylinder Gases Inc.

—Tear sheets were sent.

* * *

Welded bridges

Dear Sir:

In a recent issue of a business weekly magazine, it was reported that constant flexing by traffic of the structure of the San Francisco Golden Gate Bridge has caused its rivets to work loose. One by one, these rivets are being replaced with bolts.

Other bridges and riveted structures have had the same difficulty with loose rivets.

If these bridges had been built with welded construction, which is the simplest yet strongest way to fabricate steel structures, this extremely expensive procedure of replacing rivets would never be necessary. Furthermore, leading structural authorities state that welded bridges can be and

are built with at least 20% savings in the amount of steel used.

European countries have had a long successful experience of saving steel with not only welded bridges of long spans, but also all types of steel structures. For almost 20 years, highway and railroad bridges built in Sweden have been welded.

Why, with the evidence before us proving the advantages of welded construction, we in the United States are slow to take this step of progress is difficult to understand. Some states have adopted policies of using welded construction and others are presently considering it. Nevertheless our educators, schools, highway officials and the people who design and make bridges and other steel structures have a responsibility to make this progress as rapidly as possible.

This country is undertaking a gigantic road building program which will entail the building of many bridges with public funds. Will these bridges be obsolete before they are built?

Charles Herbruck
The Lincoln Electric Co.

* * *

Welded home

Dear Sir:

I read "Low cost welded house" by John D. Bert in the June issue of WELDING ENGINEER with great interest.

Would you kindly inform me as to where or to whom I should write for detailed information on welded houses?

Harold C. Jones
Kirkville, N. Y.

Dear Sir:

In your June issue of WELDING ENGINEER, I read with much interest the article "Low cost welded house" by John D. Bert.

I would like to know how I can acquire more information as to plans and specifications for such a home.

George Suflita
Syracuse, N. Y.

* * *

—Both writers have been referred to the author, John D. Bert.

* * *

Welding standards

Dear Sir:

I read your editorial in the August, 1955, issue entitled "Let's standardize weldments," with interest and approval. This was one of the movements I tried to assist some years ago when the first attempts were made to form a weldment manufacturers' association. It was hoped then that the

Light weight torch cuts 4" steel-*FAST*-at low pressures

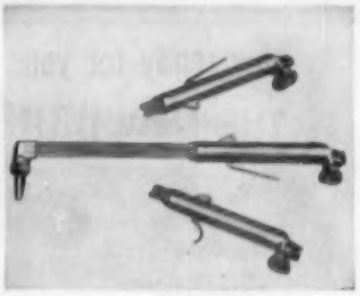
SMITH'S **Silver Star☆ CUTTING TORCH**

This is a light torch—only 2 lbs. 9 ozs. for the 20½" length. But, the way it cuts thick steel at low gas pressures is something to see. Eight pounds is all you need to cut up to ½" steel. For heavier cuts, pressures are proportionately low. Oxygen consumption reduced by 50% in some cases. That's real economy!

Another thing: You don't need a wrench with this torch! Tips slip into torch head, tighten with twist of fingers. That's a time saver! (Special Smith patent.) Lever Over Handle, Lever Under Handle, or Trigger—you have all 3 in this one torch to suit all operator requirements. Ask us for complete details on this sensational new cutting torch.

Only 8 lbs. gas pressure cuts ½" steel

Observers can't believe their eyes when they see this new Smith's Torch cutting ½" steel with only 8 lbs. oxygen pressure. Look at the gas you save! This torch costs less to operate.



Saves up to 50% oxygen

That saving counts up over a period of time! Even heavy cuts up to 10" take less gas than ordinary equipment. This torch is versatile and economical. "Burners" told us what they wanted and we built those features into this torch.

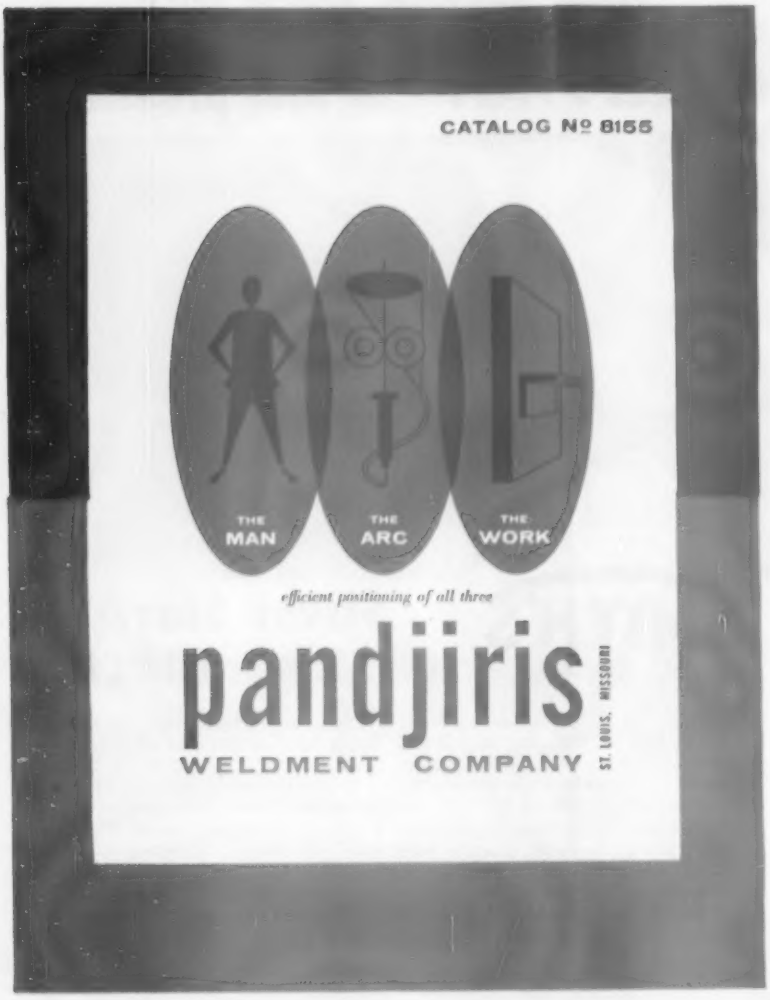
Full information on request—mail coupon

SMITH WELDING EQUIPMENT CORP.
DEPT. WE-171 • 2633 S.E. 4th Street • Minneapolis, Minn.

NAME_____

ADDRESS_____

CITY_____ STATE_____



now ready for you:

THE NEW pandjiris CATALOG

...presenting the most complete line of standard production welding equipment... and special machines engineered to meet specific requirements.

TURNING ROLLS	WELD-EVATORS
POSITIONERS	WELDING HEAD MANIPULATORS
HEAD AND TAILSTOCKS	SEAMERS
GANTRIES	AUTO-WELD-MATONS

Complete package units mounting inert gas shielded arc or submerged melt automatic heads.

write on your letterhead for your free copy today

THE WORLD'S LARGEST MANUFACTURERS OF AUTO-WELD-MATONS®

REPRESENTATIVES IN PRINCIPAL CITIES

American Welding Society could and should take the lead in the development of specifications or codes for this class of work.

I hope your editorial revives a little thinking along that line.

H. W. Pierce
New York Shipbuilding Corp.

* * *

Reprint request

Dear Sir:

We have found of interest in your Mid-June Fact File issue, the chart, on page 20, entitled "Difficulties in Metal-Arc Welding." The Burdett Oxygen Co. would like to reprint this chart in its monthly magazine.

Rhoda Soclof
Allied Advertising Agency, Inc.

—*Permission granted.*

* * *

Mid-June praise

Dear Sir:

I have looked over the Mid-June Fact File issue and think you have done a fine job. Of course, we down here at Earlbeck & Landrum think your editorials, articles, etc., are all tops, so perhaps we are a little prejudiced toward your fine magazine.

Al Earlbeck
Baltimore, Md.

Dear Sir:

The Mid-June issue of WELDING ENGINEER has just come to my desk. As a result, I'd like your permission to give you a double pat on the back.

As a distributor of welding equipment and supplies, I want you to know I appreciate this service that you are rendering the welding industry. The directory is definite and complete. It is also well prepared and, as a result, this Fact File issue of WELDING ENGINEER will be retained and used as a ready reference whenever members of our organization want information.

In addition, as president of the National Welding Supply Association, I want to sincerely thank you for the cooperation that you have extended our catalog committee.

E. C. Caluwaert
O. K. I. Welding Supply Co.

Dear Sir:

Please accept my sincere congratulatons on your Mid-June Fact File issue. It is a very useful contribution to the welding industry and not only a gigantic work but one of merit as well.

J. G. Magrath
American Welding Society

30 YEARS AGO

(Taken from *The Welding Engineer* of October, 1925)

The W. C. Gilmore Corp., recently organized in Waco, Texas, will manufacture acetylene generators, fixtures and coolers at 703 N. 6th St.

—30 YEARS AGO—

Walter Verkamp of the Ohio Electrolytic Oxygen Co. has just returned from an extended trip to Europe.

—30 YEARS AGO—

The Fibre-Metal Products Co., Chester, Pa., has just put on the market a new type of electrode holder with a non-conducting fiber handle.

—30 YEARS AGO—

C. P. Clampitt has been appointed sales manager of the Burdett Mfg. Co., Chicago. He succeeds W. R. Noxon who resigned.

—30 YEARS AGO—

John B. Gats Electric Welding & Mfg. Co., Chicago, was recently incorporated to operate a plant for electric resistance spot welding at 169 N. Ann St. The firm succeeds the John B. Gats Electric Welding Works. F. H. Leslie is president and J. B. Gats is vice-president and general manager.

—30 YEARS AGO—

Youngstown Welding Co., Youngstown, Ohio, is planning to start construction of a new factory next spring.

—30 YEARS AGO—

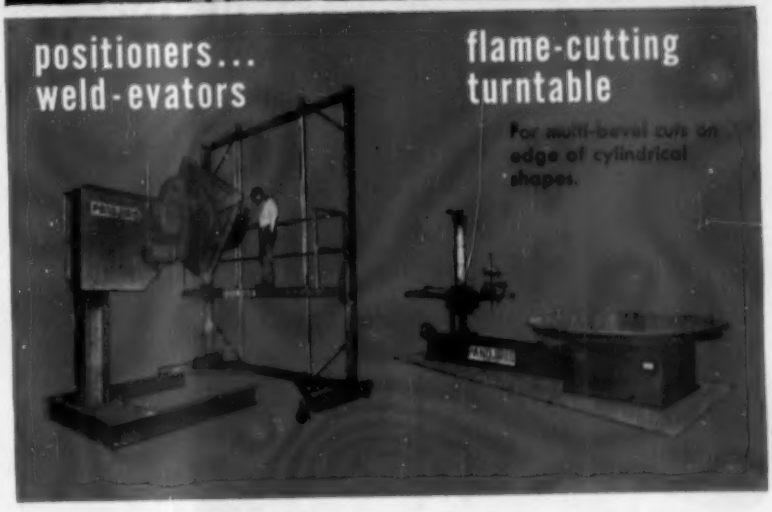
J. M. Robinson has been appointed manager of the Detroit office of The Lincoln Electric Co., Cleveland. G. W. First has been transferred to the Grand Rapids office, and J. E. Durstine to the Buffalo office.

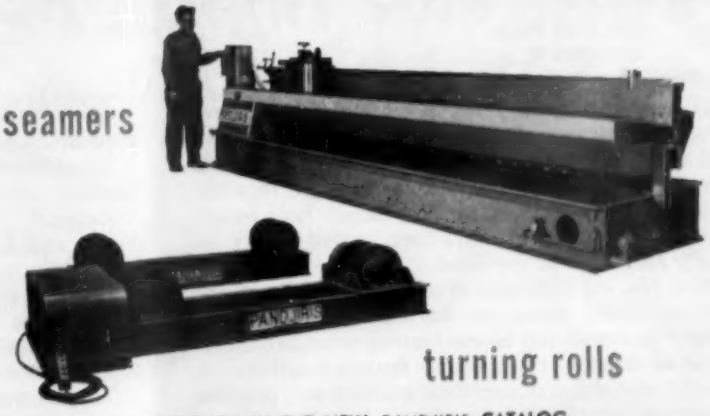
—30 YEARS AGO—

J. B. Green, president, Chicago Steel & Wire Co., Chicago, and H. S. Card, managing editor, WELDING ENGINEER, visited Universal Oxygen Co., Milwaukee, recently. S. H. Smith is plant manager.

—30 YEARS AGO—

An article states that the cause of the boiler explosion of the *S. S. Mackinac* off the Newport News coast was not due to faulty welding, but to rupture of the circulating drum sheet which was old and corroded.





SEE THEM IN THE NEW *PANDJIRIS* CATALOG

Welding Helmets

604-3-C
with 1136 Plastic Lift-Front
Glass Holder

AO† Fiberglas*
Welding Helmets are
LIGHT EXTRA STRONG MOISTUREPROOF
NON-WARPING
HEAT RESISTANT EASILY STERILIZED

600-3-C
with 1130 Plastic
Glass Holder

700-3-C
with 1130 Plastic
Glass Holder

704-3-C
with 1136 Plastic Lift-Front
Glass Holder

Shells are made from a thermo-setting, Fiberglas reinforced, Polyester Resin, compression molding — and are lighter than vulcanized fibre. Reinforcement around edges provides additional strength to withstand wear and abuse. The ruggedness, heat resistance and superior wear have been proved in service. Easily cleaned and sterilized.

New No. 3C Headgear of new plastic will not absorb moisture, hence no warpage or discomfort. Helmet is suspended on connecting arms and floating at all times — thus permits flexible headband to readily take shape of any head contour and provide maximum comfort. Attached to helmet by new Type "C" outside adjustable friction joint. Ratchet type headsize adjustment fits any head.

In addition to 1130 and 1136 plastic glass holders (shown) helmets are available with 1096 Insulated Dowmetal Lift-Front or 1085 Insulated Steel. Filter and Cover Glass on all Glass Holders are easily inserted or removed. All Glass Holders take either 2" x 4¼" standard or 2" x 4⅛" glass.

New type "S" Four Position Adjustable Helmet Stop quickly and easily adjusts to wearer in any of four positions.

Your nearest AO Safety Products Representative can supply you.

You Can't Buy Better Quality!

American Optical
SAFETY PRODUCTS DIVISION

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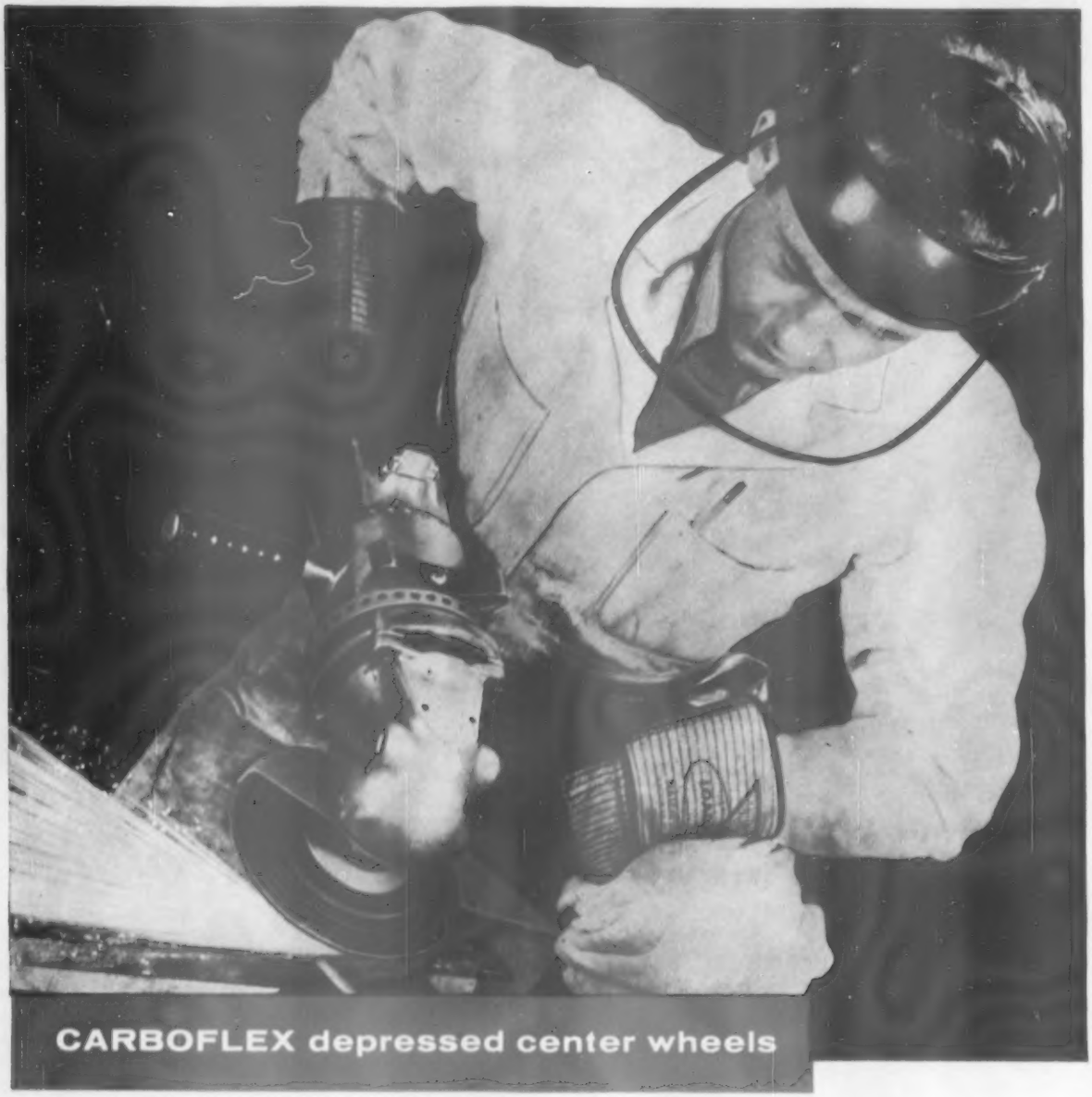

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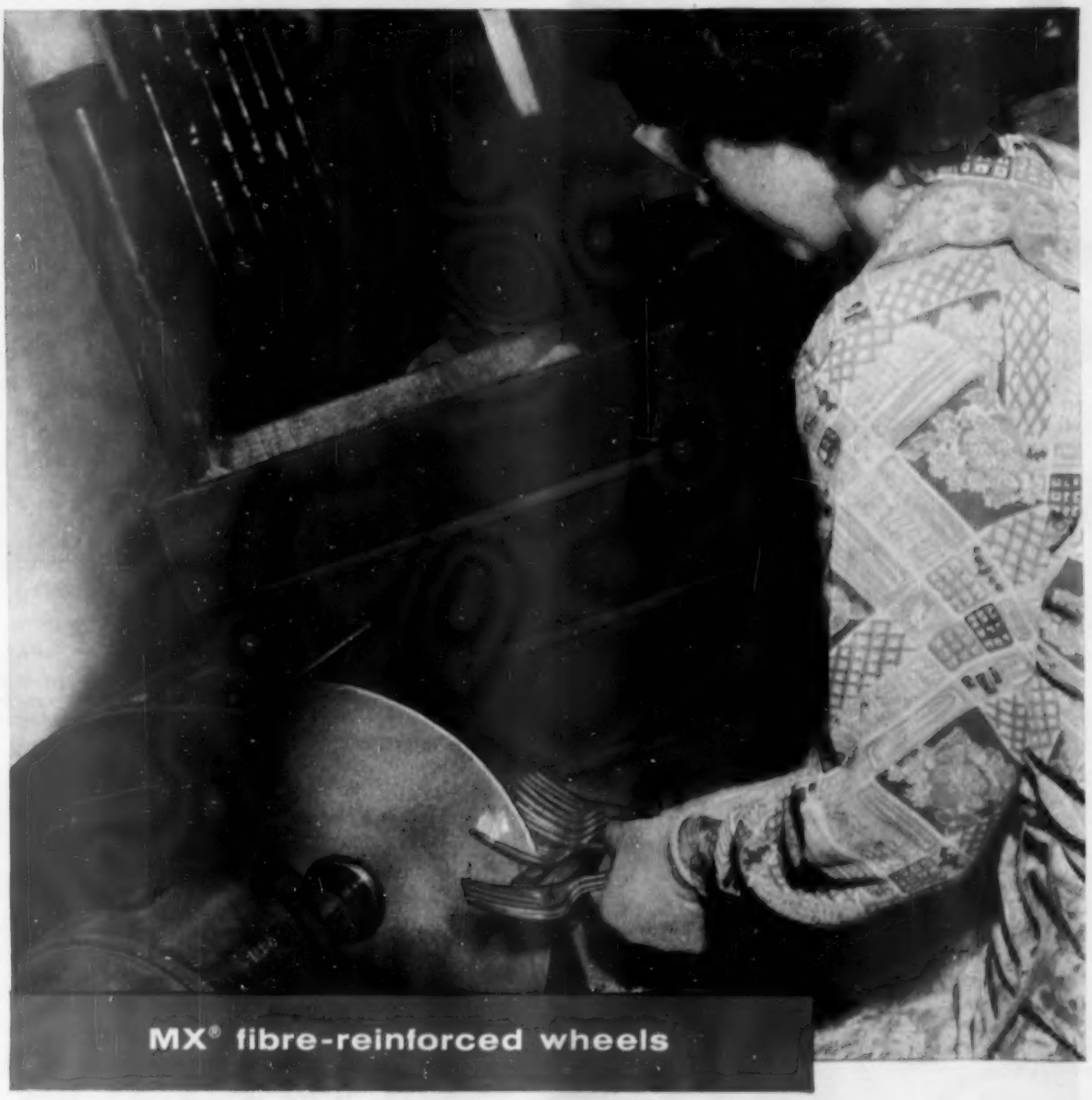

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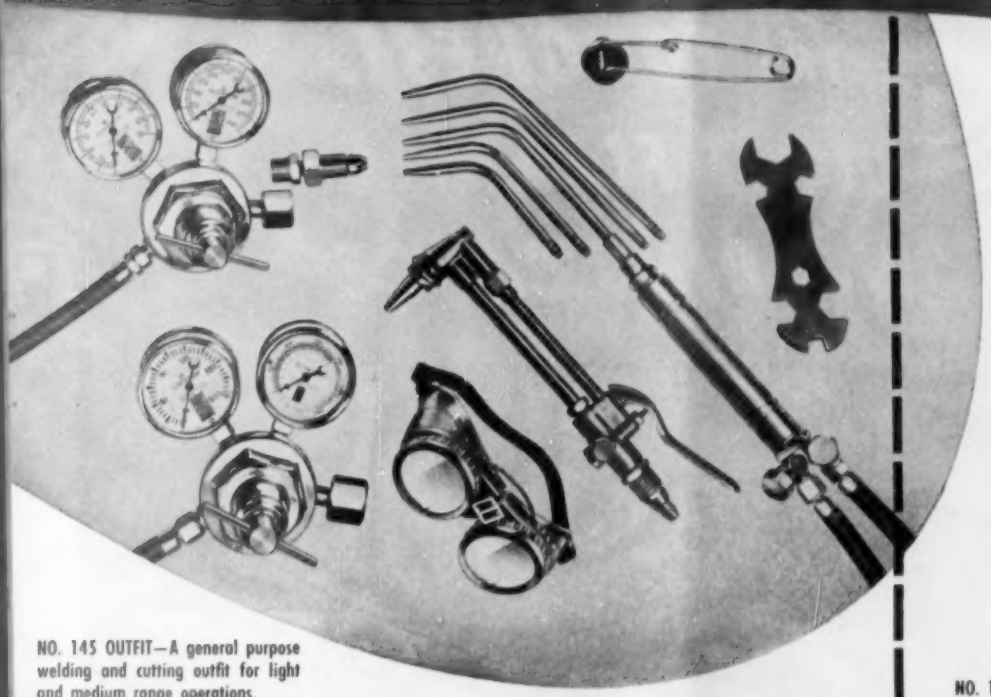

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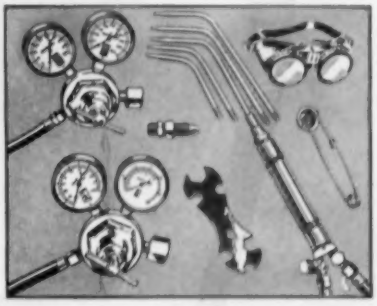

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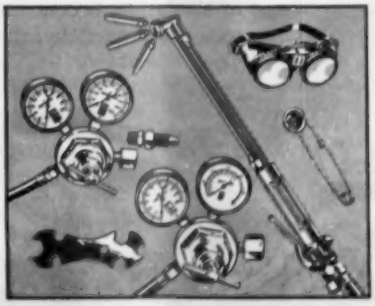

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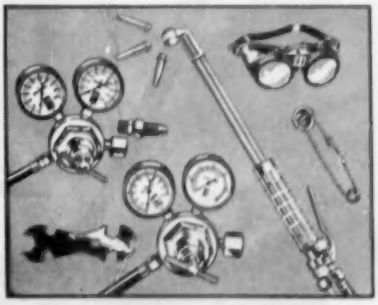

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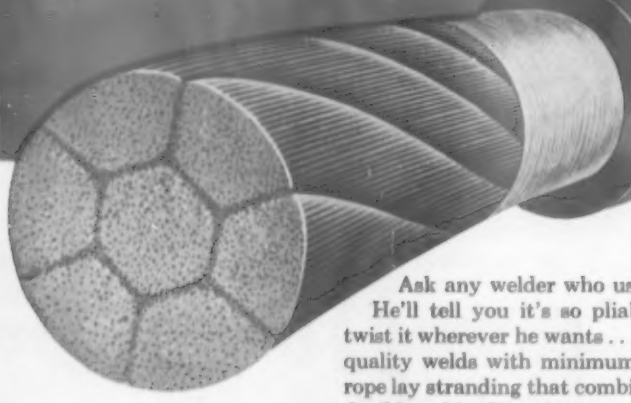

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A. Norton B-11 wheels – for your heavier jobs

Q. What's new about B-11 wheels?

A. Their great new resinoid bond, improved uniformity and balance, new "TOUCH of GOLD" performance-benefits

Q. What is the B-11 bond?

A. It's the latest Norton resinoid bond. B-11 wheels made with it are excellent for heavy weld grinding.

Q. Why?

A. Because B-11 wheels are more uniform in structure, with better balance. As a result, they "hug that work" closer, grind cooler and faster, with less vibration and bounce.

Q. What about these "Touch of Gold" benefits?

A. They're the direct result of the B-11 wheels' more efficient grinding action. They include new standards of balance which mean less operator-fatigue and longer wheel life — and they add up to more profitable grinding for *you*.

Q. Any other advantages of B-11 wheels?

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ESTABLISHED 1916 **Welding Engineer** OCTOBER, 1955

Too much regulation!

WELDING is one of America's best-regulated industries—not necessarily the most orderly, but certainly one of the most restricted!

This issue of WELDING ENGINEER contains an article outlining some of the codes and standards confronting those engaged in fabrication of welded pressure piping. In addition to the 19 codes this author lists, the fabricator generally is faced with several state and local codes—to say nothing of the whims of labor leaders in the area.

The progress that has been made by the welding industry is really surprising in view of these roadblocks that have been thrown in its path.

Welding and the national debt have this much in common: every organization coming in contact with either of them feels obligated to add something to them. But the national debt, at least, has Congress standing by to put a limit on possible additions.

There is no such umpire for the welding industry, so everybody and his brother gets into the act. The result is *too much regulation*.

The American Welding Society was organized in 1919 to "foster and promote the use of welding." Since that time, the Society has developed some 35 codes and standards pertaining to welding and the materials used in welding. The Society also has cooperated with other engineering groups in developing some of these codes and standards.

Why, then, is it necessary for 19 additional groups to formulate their own welding regulations?

ONE of the strange things about a number of these welding codes is their inconsistency. For example: it is quite all right to weld the coupling draw-bar housing on a Diesel locomotive—it only has to pull a train weighing thousands of tons. But on this same locomotive, you can't weld the ladder steps or grab-irons because they "would not be safe" to carry the 170-lb load of a brakeman!

This type of thinking prevails partly because there are still too many people who think like a former boss of mine. In 1939, the writer was hired to "incorporate as much welding design as possible" in some large, ocean-going ships. My boss, a fine gentleman, had been on the job for 44 years, but had little faith in welding and welded constructions.

Everything we tried to do was vetoed, and always with the same words: "Jefferson, that won't work. We tried something like that on the S.S.——in 1916 and it didn't work." As far as my boss was concerned, there had been no change in welding, its procedures, processes or materials since 1916—23 years.

UNFORTUNATELY, there are many others who still feel that way today. But now, those 23 years have stretched to nearly 40.

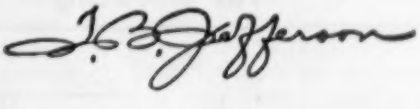
Another strange aspect of restrictions placed on welding: when the job is rated too difficult for other joining processes, welding becomes an approved method. How can a process be accepted for unusual applications, yet be questionable on the easy, everyday jobs?

The few welding standards which are jointly sponsored by AWS and another engineering society seems to work out well. Possibly, additional standards of this sort, formulated in cooperation with other societies, will help clear the confused, multiple-regulation situation now frightening fabricators away from welding.

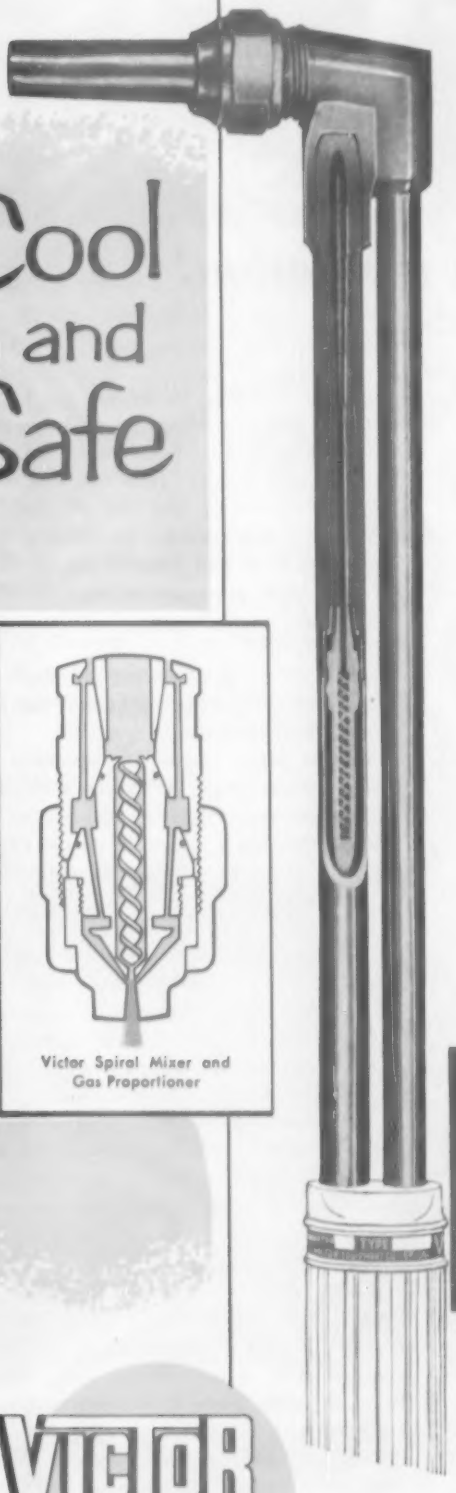
If AWS were a joint sponsor of all welding regulations, it would mean at least a single source for these rules. This should eliminate much of the confusion, and pave the way for savings in time and money.

Unless something is done to gather all codes and standards on welding under the wing of AWS, welding may find itself even more regulated. For, despite the many groups already in the act, new ones using welding somewhere in their industry will strive to bring glory to themselves with welding regulations all their own.

Let's not open the door for more. Nineteen organizations calling the shots on welding already provide *too much regulation*.



Cool and Safe



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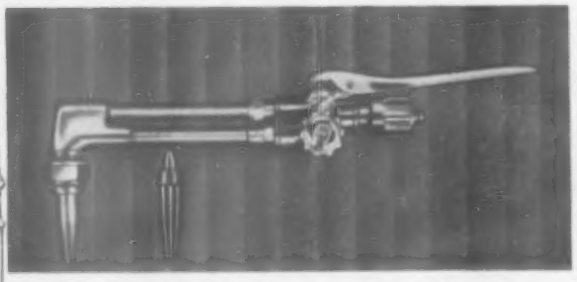
Victor Spiral Mixer and Gas Proportioner



Cutting attachment, and cut-away of a typical Victor tip, showing carefully proportioned orifices. For best results, always use Victor tips with Victor torches.

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In the August issue, WELDING ENGINEER presented an article which detailed the welding safety codes adopted by the state of Wisconsin. Mr. Mueller deals with this same topic on a much broader level, discussing welding procedure and weldor qualification on the basis of present nation-wide applications. Be sure to read the editorial on welding codes in this issue.—*The Editors*

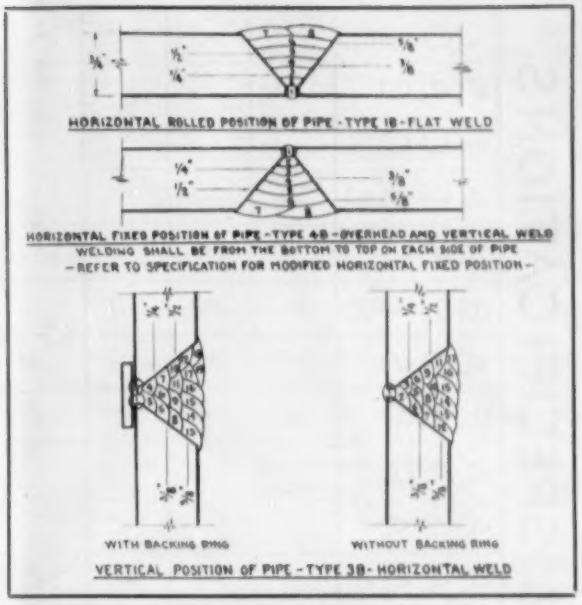

HORIZONTAL ROLLED POSITION OF PIPE - TYPE 1G - FLAT WELD
HORIZONTAL FIXED POSITION OF PIPE - TYPE 4G - OVERHEAD AND VERTICAL WELD
WELDING SHALL BE FROM THE BOTTOM TO TOP ON EACH SIDE OF PIPE
- REFER TO SPECIFICATION FOR MODIFIED HORIZONTAL FIXED POSITION -
WITH BACKING RING
WITHOUT BACKING RING
VERTICAL POSITION OF PIPE - TYPE 3G - HORIZONTAL WELD

FIG. I—Example of an essential requirement in preparing a welding procedure.

19 codes!

Standards for welding: complicated and confusing

BY RAY A. MUELLER*

THE establishment of welding procedures and qualification standards for weldors is an extremely broad one since welding is employed in so many branches of industry, and welding processes applied in all industries are numerous.

It would be impossible to discuss welding procedures without first giving consideration to the various codes and specifications which govern welding in any industry.

The existence of many codes appears to be confusing and annoying to manufacturers and users alike. They are also apt to be misunderstood by persons entering into a field of welded construction where regulations are mandatory.

A further complication arises from the fact that the various codes necessarily are subject to constant revision to reflect current advances in application. Many groups cooperate in these efforts to reflect a universal standard for the welding industry.

The basic fields employing welding methods can be classified into three categories: *(1)* vessels and piping; *(2)* structures, and *(3)* transportation products.

Each field produces an ultimate product which, if it is improperly made and fails in service, could cause serious harm and damage to life and property. Therefore, the federal government, the states, cities and municipalities throughout the United States are very concerned with the engineering design, manufacture and erection of these products.

Code-Making Bodies

Because of this potential hazard, the minimum requirements for safety in design and construction are regulated by codes and specifications prepared by various organizations. Localities affected by the product may make any one or a combination of code regulations mandatory.

At the top of Fig. II are listed the prominent specification and code-making bodies in the U. S. Reading from left to right, they are:

American Welding Society, which serves as a guide to all industries employing welding methods. The most widely used standards are the "Filler Metal Specifications" developed jointly with the ASTM.

American Society for Testing Materials, which has formulated over 1,500 standard specifications for metals and test methods widely used in industry since 1902.

American Society of Mechanical Engineers, being a founder society in engineering, pioneered in developing standardization in this country. They established the first standard dimensions for cast-iron pipe flanges.

The ASME Power Boiler Code is mandatory in over half the states of the U. S., and the Unfired Pressure Vessel Code is mandatory in nine states. The National Board of Boiler and Pressure Vessel Inspectors is the enforcing body in political sub-divi-

*Registered professional engineer and general foreman, Pipe Fabrication Dept., Manufacturing Division, Crane Co., Chicago.

STANDARDS, PROMINENT CODES & SPECIFICATIONS

BASIC FIELDS IN WELDING	SPECIFICATION, STANDARD, CODE	AWS	ASME	ASSP	ASME	MSS	PHCA	NFPA	AWWA	AARA	AFBS	ABMA	BUSINESS	AISC	ISCEA	LOCAL
PIPE AND VESSELS	PRESSURE VESSELS AND BOILERS	X	X	X				X			X	X	X	X		X
	INDUSTRIAL PIPING	X	X	X	X	X	X		X		X	X	X			X
	TRANSMISSION PIPE LINES	X	X	X	X	X			X	X	X					X
STRUCTURES	STORAGE TANKS	X	X	X				X	X							X
	BUILDINGS	X	X					X						X		X
	BRIDGES	X	X							X				X	X	X
	MACHINERY CONSTRUCTION	X														X
TRANSPORTATION	SHIPS	X										X	X			
	RAILROADS	X		X						X	X				X	X
	AIRCRAFT	X									X				X	
	AUTOMOTIVE	X													X	

FIGURE II

sions which have adopted the code, and insurance underwriters also require adherence to its regulations in welded construction.

American Petroleum Institute formulated with ASME the most widely used standard for materials, design and construction in the petroleum industry, covering unfired pressure vessels for petroleum liquids and gases.

American Standards Association, sponsored by the ASME, developed a national code known as the "Code for Pressure Piping," first published in 1935. The present ASA Code has adopted the ASME requirements for procedure and operator qualification (Section IX, ASME Boiler Code).

Manufacturers Standardization Society of the Valve and Fitting Industry has been setting standards since 1911, and endeavors to cooperate with all groups interested in standardization work affecting valves and fittings.

Pipe Fabrication Institute is an organization of pipe fabricators interested in standardizing engineering design and fabrication details.

Heating, Piping and Air Conditioning Contractors National Association has formulated standard welding procedures for manual metal-arc and oxyacetylene welding of pipe, which meet the requirements of the ASME Boiler Code.

National Certified Pipe Welding Bureau is an affiliate of HPACC, and has as its purpose administration of weldor qualification tests in accordance with Section IX of the ASME Boiler Code and with the standard procedures of HPACC. It also deals with inter-change of qualified weldors between contractors who have adopted standard procedures without the necessity of retesting them.

National Board of Fire Underwriters devised a code which refers almost directly to the ASME Boiler Construction Code.

American Water Works Association, the most prominent standard of which is the specification for electric fusion welded steel water pipe in sizes up to 30 in. in diameter and over, incorporating AWS recommendations.

American Gas Association, prominent specifications and recommendations of which are incorporated in the ASA Code for Pressure Piping.

Association of American Railroads, which has published the most widely used standards in the railroad field, including various material specifications and the rules of interchange.

FSB, formerly known as the *Federal Specifications Board*, is now referred to as the *Standards Division of Federal Supply Service in General Services Administration*, and issues numerous material and product specifications for federal procurement.

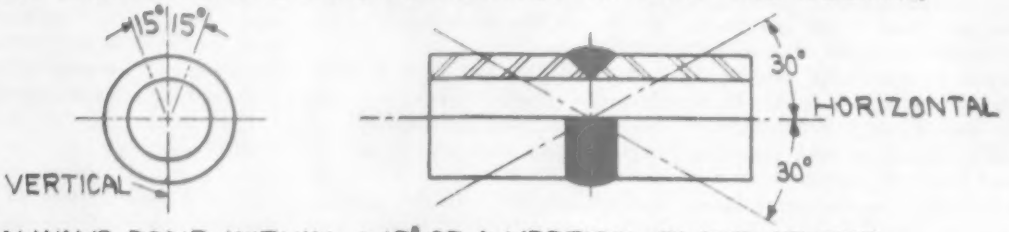
American Bureau of Shipping published its prominent requirements in the "Rules for the Building and Classing of Steel Vessels." Also applicable, are the U. S. Navy regulations of the Bureau of Ships ("General Specifications for Building Vessels, for Machinery and for Inspection of Mate-

FIG. III—Chart shows one phase of procedure and performance qualification test.

Thickness *t* of Test Pipe or Plate - inch -	PROCEDURE QUALIFICATION						PERFORMANCE QUALIFICATION				
	Range of Thickness of Materials Qualified		Type and No. Tests Req.				Range of Thickness of Materials Qualified		Type and No. Tests Req.		
	Min.	Max.	Red. Sect. Tensile	Jig Side Bend	Jig Face Bend	Jig Root Bend	Min.	Max.	Jig Side Bend	Jig Face Bend	Jig Root Bend
1/16 to 3/8	0.5 t *	2 t	2	0	2	2	0.5 t *	2 t	0	1	1
3/8 to 3/4	3/16"	2 t	2	0	2	2	3/16"	2 t	0	1	1
			2	4	0	0			2	0	0
over 3/4	3/16"	2 t	2	4	0	0	3/16"	Max. Thick. to be Welded	2	0	0
SPECIAL NOTES →	* but not less than 1/16 inch 1.) Max. thickness qualified in gas welding is the thickness of the test plate or pipe. 2.) Max. thickness qualified with pipe smaller than 5" dia. is 3/8". 3.) For submerged-arc welding involving single pass welding per thickness, the following limitations exist: a) Welding from one side only:--the maximum thickness qualified shall not exceed the thickness of test plate or pipe. b) Welding one pass from each side:--The maximum thickness qualified shall be 2 t, where 2 t does not exceed 2". If sections heavier than 2" are to be welded in production, a separate test sample shall be prepared of a thickness not less than the thickness to be used in production.						* but not less than 1/16 inch 1.) A total of four (4) guided bend test specimens are required to qualify in position 5G. 2.) Maximum thickness qualified in gas welding is the thickness of the test pipe or plate. 3.) The tests specified above are not required for operators of machine welding (automatic) equipment in which rate of travel and the position of welding-head with respect to the work are controlled mechanically.				

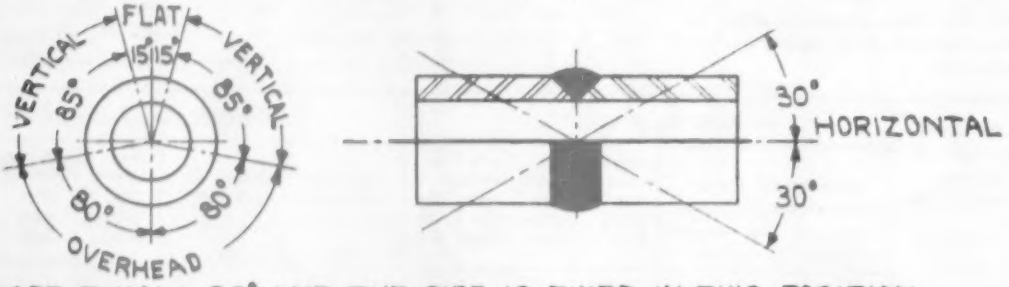
BUTT WELDS

TYPE 1B WELDS: (HORIZONTAL ROLLED POSITION - FLAT WELD). BUTT WELDS IN PIPE IN WHICH THE AXIS OF THE PIPE AT THE JOINT DOES NOT DEVIATE FROM THE HORIZONTAL BY MORE THAN ± 30° AND THE PIPE IS ROTATED SO THAT THE WELDING



IS ALWAYS DONE WITHIN ± 15° OF A VERTICAL PLANE AT THE JOINT. (FLAT POSITION OF WELDING).

TYPE 4B WELDS: (HORIZONTAL FIXED POSITION - VERTICAL & OVERHEAD WELDS). BUTT WELDS IN PIPE IN WHICH THE AXIS OF THE PIPE AT THE JOINT DOES NOT DEVIATE FROM THE HORIZONTAL



BY MORE THAN ± 30° AND THE PIPE IS FIXED IN THIS POSITION SO THAT THE WELDING IS DONE IN A COMBINATION OF FLAT, VERTICAL, AND OVERHEAD POSITIONS OF WELDING. (AS SHOWN IN THE SKETCH ABOVE).

TYPE 3B WELDS: (VERTICAL POSITION - HORIZONTAL WELD). BUTT WELDS IN PIPE IN WHICH THE AXIS OF THE PIPE AT THE JOINT DOES NOT DEVIATE FROM THE VERTICAL BY MORE THAN ± 10° AND THE PIPE MAY OR MAY NOT BE ROTATED DURING WELDING SO THAT A HORIZONTAL WELD IS PRODUCED AROUND THE ENTIRE CIRCUMFERENCE.

WHEN THE PIPE IS FIXED AND THE AXIS OF THE PIPE AT THE JOINT DEVIATES FROM A HORIZONTAL PLANE BY MORE THAN ± 30° AND FROM THE VERTICAL BY MORE THAN ± 10°, THE WELDING WILL BE DONE IN A COMBINATION OF HORIZONTAL AND OVERHEAD POSITIONS.

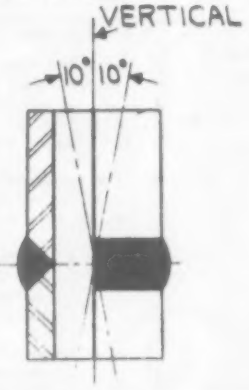


FIGURE IV—In preparing a procedure specification, welding positions must be stated. The author recommends an accompanying sketch, like the one above covering butt welds in piping, for further amplification of remarks.

GENERAL MATERIAL CLASSIFICATION		PROCEDURE QUALIFICATION		PROCEDURE AND OPERATOR QUALIFICATION				
		BASE METAL	WELD METAL	METAL-ARC WELDING ELECTRODES (ASTM A233, A316, A298 SPECS.)				GAS WELDING ROD (ASTM A251 SPEC.)
				IRON OXIDE COATING EXX20 EXX30	TITANIA COATING EXX12 EXX13	CELLULOSIC COATING EXX10 EXX11	LOW HYDROGEN COATING EXX15 EXX16	TYPES GA & GB GX45 & 55 GX60 & 65
PLAIN STEELS	Plain Carbon Steel	P1	A1	P1	P2	P3	P4	P6
	Wrought Iron	P2						
LOW ALLOY STEELS	2% Max. Total Alloy Content (1/2% Max. Chromium Content)	P3	A2	P1	P2	P3	P4	P6
	2-3/4% Max. Total Alloy Content (1/2 to 2% Max. Chrome Content)	P4	A3	P1	P2	P3	P4	
MEDIUM ALLOY	10% Max. Total Alloy Content (2-1/4% to 9% Max. Chrome Content)	P5	A4	P1	P2	P3	P4	
HIGH ALLOY STEELS	Martensitic Structure (Typical 10 to 15% Chrome Content)	P6	A5				P4	
	Ferritic Structure (Typical 17 to 30% Chrome Content)	P7	A6				P4	
	Austenitic > 1% Ferrite (Typical 18/8 Chrome-Nickel)	P8	A7				P5	
	Fully Austenitic (Typical 25/20 Chrome-Nickel)		A8				P5	

FIG. V—Another phase of procedure and weldor qualifications.

rial.")

American Institute of Steel Construction, which published the "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings by Arc and Gas Welding," and the "Manual of Steel Construction."

Interstate Commerce Commission, the most prominent standard of which in the welding field is the "Specifications for Tank Cars Having Fusion Welded Steel Tanks."

Society of Automotive Engineers, noted for its various material specifications, relies upon AWS specifications for welded applications.

It is quite evident that the piping and vessels group incorporates many standards. However, it can generally be agreed that welding requirements are quite similar, with the ASME and ASA codes predominant.

Fortunately, current requirements for welding procedure and weldor qualification in both codes are essentially the same, following Section IX of the Boiler Code. Therefore, the remainder of this article will relate only to the ASME and ASA Codes. And for simplicity, steps necessary in establishing a welding procedure, and in qualifying procedures and weldors, will be confined to metal-arc welding of single-butt joints.

Welding Procedures

The most important phases of investigation in obtaining data to establish a welding procedure specification are:

(1) Study of base metal properties, including mechanical, chemical and thermal properties.

(2) Study of filler metal properties and usability characteristics.

Base metal studies generally will determine preheat and post-heat requirements, chemical and physical requirements of electrode to be used, and type of welding joint.

Filler metal studies basically will determine the type of welding bevel and welding technique to be employed. As a prelude to establishing welding procedures, the following statement is clearly indicated in the ASME, ASA and AWS codes:

"Each manufacturer or contractor shall be responsible for the quality of the welding done by his organization and shall conduct tests, not only of the welding procedure to determine its suitability to insure welds which will meet the required tests, but also of the welding operators to determine their ability to make sound welds under standardized test conditions."

Furthermore, "it is assumed that the manufacturer or contractor has an organization familiar with the various welding codes and capable of designing, engineering and supervising welded construction."

Use of Technical Articles

A fabricator can make good use of technical articles published in such a magazine as WELDING ENGINEER, and by other industrial organizations and trade journals. A careful literature survey of material to be used in construction should reveal properties necessary to establish information on treating base metal, and for selecting a filler metal.

Most electrode manufacturers have testing laboratories, and can supply adequate chemical and mechanical test results. However, welding technique employed by an electrode manufacturer may differ from that intended for use in production.

Therefore, tests are recommended where experimental welds are made using intended fabricating procedure. Standard test specimens can then be machined from welded samples and tested using the AWS code requirements for method and acceptance of

results.

The following requirements are essential in preparing a welding procedure:

Procedure Specifications

Process: State the welding process to be employed, such as metal-arc welding.

Base Metal: Specify base materials involved in construction by referring to ASTM or other code designations. In the absence of these, describe chemical composition, mechanical properties or other metallurgical properties that may be necessary to cover adequately the intended requirements.

Filler Metal: Name the applicable ASTM-AWS designation and electrode classification. Considering metal-arc welding, three ASTM specifications cover arc-welding electrodes: A233-55T for mild steels; A316-54T for low-alloy steels, and A298-55T for corrosion-resisting chromium and chromium-nickel steels.

Welding Positions: Describe positions in which welding will be done. This may be amplified by a sketch (see Fig. I).

Preparation of Base Material: A data sheet should be included in the procedure covering the shape of welding grooves, land thickness and root spacing for different thicknesses involved. A word description should be included dealing with methods of forming welding scarfs, i.e., machining, flame-cutting, grinding or shearing. Cleanliness of the surface to be welded also should be stated.

Nature of Electric Current: State whether current is alternating or direct and, if it is the latter, specify polarity. This will depend upon electrodes selected when metal-arc welding is employed.

Welding Technique: Electrode sizes, arc voltage-amperage range, number of weld passes for each thickness, and welding technique should be indicated.

Other essential requirements that should be stated in the welding procedure specifications are as follows:

(a) Appearance, cleaning and treatment of defects in welding layers.

(b) Preheating and temperature control.

(c) Post-heat treatment requirements.

The purpose of a qualification test on a prescribed welding procedure is to show that the combination of process, material and technique produces welds of desired strength, ductility and soundness, meeting applicable code requirements.

These procedures then become welding specifications which must be followed in making weldments on materials within ranges given in the applicable code. They provide a means of assuring reproducible results and quality control.

The purpose of the weldor's qualification test is to determine the ability of weldors in applying specific welding techniques and in making sound welds. (See Figs. III and V).

Qualification Variables

There are some important variables in qualification procedure which are worth noting:

(1) Qualifying both welding procedure and weldor by using groove-welded joints qualifies groove and fillet welds, but not vice-versa.

(2) Qualifying single-welded butt joints without a backing strip (in metal-arc welding) qualifies the procedure and weldor for welding joints with and without a backing, but not vice-versa.

(3) The weldor employed in qualifying a welding procedure becomes qualified without a separate performance test.

Also involved in qualification of the welding procedure are the following essential variables:

(a) When a base metal specification is changed, effecting a change from one P-number to another, the procedure must be completely requalified.

(b) When the filler metal specification is changed, effecting a change in A-numbers, the procedure must be completely requalified. A requalification is necessary also when there is a change in F-numbers.

(c) When the welding process is changed, i.e., from d-c to a-c or vice-versa, the procedure must be completely requalified.

(d) When welding positions other than those already qualified are added to procedure specifications, the procedure must be requalified.

(e) When the basic heat-treatment requirement is changed, the procedure must be completely requalified.

(f) When the preheat temperature specified in the procedure specification is decreased by 100 F or more, the procedure must be completely requalified.

Essential variables involved in the performance qualification are as follows:

(1) When a weldor intends to use a welding process different from that specified in the procedure specification, he must be requalified with the new process.

(2) A weldor who intends to employ a change from upward to downward, or from downward to upward, in the progression specified for any pass of a vertical weld must be requalified.

(3) A weldor who intends to employ an electrode which effects a higher F-number than the classification for which he is qualified must be requalified using the higher F-number electrode.

(4) A weldor displaying valid reasons to question his ability to weld satisfactorily must be completely requalified.

(5) A weldor that has not employed the specific welding process for which he was qualified during a 3-month period or longer must be requalified in at least one test position.

Comments on Weldor Qualification

Performance qualification tests determine the *minimum* standard performance of weldors in making certain welds following a prescribed procedure. It must be realized, however, that merely passing minimum requirements for qualification does not guarantee that the weldor will consistently produce acceptable work.

Passing minimum qualification test requirements indicates only that the weldor has acquired sufficient skill to produce work that is acceptable when compared to that produced by a weldor failing to pass minimum qualification requirements.

It must also be remembered that a manufacturer or contractor employing a qualified weldor is in no way relieved of the responsibility of providing:

(a) adequate welding supervision;

(b) quality control;

(c) adequate preparation of work prior to welding;

(d) inspection of materials and processes prior to welding;

(e) furnishing welding equipment in proper condition and filler metals of proper quality;

(f) adequate procedures for the operation.

CONVENTION Halls, Philadelphia, where manufacturers will display and demonstrate welding products during AWS Fall Technical Meeting.

"Philly" the host for AWS Fall Meeting

THE American Welding Society will present its National Fall Meeting for 1955 in Philadelphia, Pa., on October 17-21. The Bellevue Stratford Hotel will serve as headquarters for the AWS group. Welding exhibits will be on display in Philadelphia's Convention Halls.

Highlighting the technical sessions will be the presentation of the Adams Lecture by LaMotte Grover of Air Reduction Sales Co. His talk, "An Interpretation of Research and Experience in Structural Welding," will be given at a special honors session on Monday morning, Oct. 17.

Also at this session, awards will be presented to those persons who have made outstanding contributions to the advancement of welding.

President J. H. Humberstone and the other AWS officers have scheduled an outstanding group of speakers who will present papers on the latest trends, developments and uses of welding. In the course of 21 technical sessions, over 60 papers on all phases of welding will be given.

Visitors to the meeting may listen to guest speakers at any of three simultaneous sessions to be held at each of the following times: Monday afternoon, Oct. 17; Tuesday morning and afternoon, Oct. 18; Wednesday morning and afternoon, Oct. 19; Thursday morning, Oct. 20, and Friday morning, Oct. 21.

Topic Listing

Topics for discussion are categorized under these headings: CO_2 Gas-Shielded Welding; Resistance Welding; Weldability and Research; Structures; Inspection and Testing; Shipbuilding; Welding Equipment; Stainless Steels; Welding Electrodes; Applications; Titanium and Molybdenum; Pressure Vessels; Aluminum; Piping and Pressure Vessels; Brazing, and Maintenance and Cutting.

The President's Reception and National Dinner is one of the most important events scheduled for the five-day meeting. Also high on the list of "things to do" are several tours through leading manufacturing plants in the Philadelphia area, and many educational lectures.

This Fall Meeting of AWS is once again running concurrently with the National Metals Exposition. Convention Hall is the site of the Exposition, and there the visitors may see welding and cutting exhibits and demonstrations.

Among those welding supply manufacturers who will display products at the Exposition are:

Air Reduction Sales Co.
American Brake Shoe Co.
American Brass Co.
American Chain & Cable Co., Inc.
American Optical Co.
Arcair Co.
Aro Spotwelders Corp.

Balteau Electric Corp.
Banner Mfg. Co.
Bausch & Lomb Optical Co.
Black & Decker Mfg. Co.
Branson Instruments, Inc.
Bristol Co.

Coast Metals, Inc.

Detroit Testing Machine Co.
The Diversey Corp.

Electric Arc, Inc.
Empire Products, Inc.
Eutectic Welding Alloys Corp.

General Electric Co. (Apparatus)
General Electric Co. (Carboloy)
Grand Specialties Co.

Harnischfeger Corp.
Heath Engineering Co.
The Hobart Brothers Co.
Holger Andreasen, Inc.

International Nickel Co., Inc.

Kasson Die & Motor Corp.
Andrew King

Lapeer Mfg. Co.
The Lincoln Electric Co.
Lindberg Engineering Co.
The Liquid Carbonic Corp.

Magnaflux Corp.
Metal & Thermit Corp.
Metallizing Co. of America
Minnesota Mining & Mfg. Co.
Mitchell Radiation Products

National Torch Tip Co.
National Welding Supply Ass'n.
North American Philips Co.

Oakite Products, Inc.

Phoenix Products Co.
Precision Welder & Flexopress
Pyrometer Instrument Co., Inc.

Reid-Avery Co., Inc.

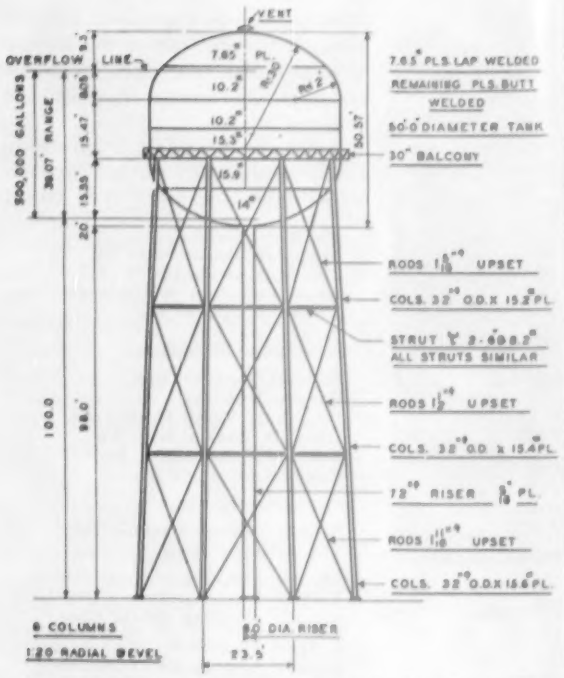
Sciaky Brothers, Inc.
Selas Corp. of America
Skil Corp.
A. O. Smith Corp.
Smith Welding Equipment Corp.
Stanat Mfg. Co.
Steel City Testing Machines, Inc.

Tempil Corp.
Thomson Electric Welder Co.
Thor Power Tool Co.
Titan Metal Mfg. Co.
Torit Mfg. Co.
Triplett & Barton, Inc.
Turco Products, Inc.

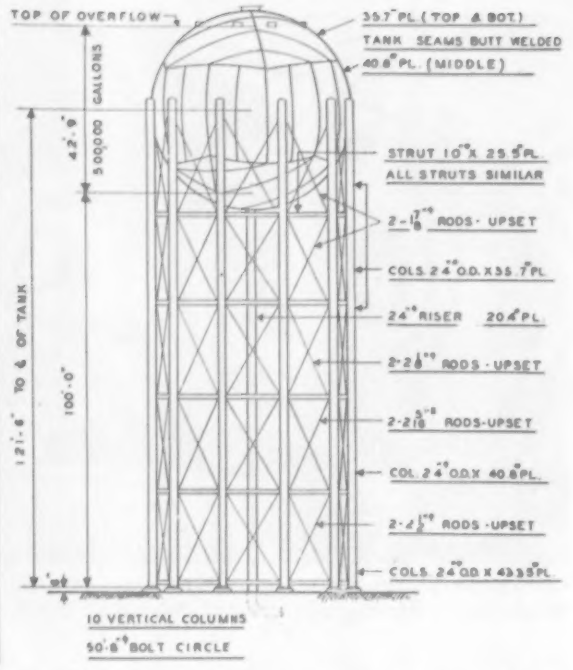
Union Carbide & Carbon Corp.
United Welders, Inc.
United Wire & Supply Corp.

Vacu-Blast Co., Inc.
Vickers Electric Div.

Weltronic Co.
Westinghouse Electric Corp.
Wheelabrator Corp.



STANDARD elevated water tank, of double-elliptical design, was model on which research studies were based. Roof of this tank would collapse first if atomic blast occurred less than 2½ miles away



NEWLY designed 500,000-gal tank can withstand blast equal to 20,000 tons of TNT at a distance of ½ mile. Tower has spherical tank, more and stronger columns, larger sway rods to withstand severe pressures

Welded water tanks can be disabled or totally destroyed if they are not...

Built to take an atomic blast

DESIGNERS of welded steel fabrications have long been familiar with the steps which must be taken to relieve, through adequate construction methods, the stress loads placed upon structures by such recurring phenomena as earthquakes and hurricanes.

In the last eleven years, however, an unnatural force has entered the picture and, though we hopefully view it as non-recurring, its impact load on steel structures presents entirely new problems which must be carefully considered.

That force, which can blast an average elevated 500,000-gal water tank out of service at any distance less than 2½ miles from the point of explosion, is the atomic bomb.

The United States Atomic Energy Commission, in seeking new and better methods for safeguarding, among other things, America's vital water supply in event of an atomic attack, handed the water tank problem to the Pittsburgh-Des Moines Steel Co. of Pittsburgh.

The company was charged with the responsibility of developing a new type of tank which could withstand the overpressure effects resulting from the explosion of a nominal 20kt atomic bomb—a blast equal to that of 20,000 tons of TNT.

Roof Weakness

Investigations by the company disclosed that the ellipsoidal steel roof appeared to be the weakest member in tanks of standard construction.

Theoretical determinations indicated that this welded tank portion could resist an external pressure of 1.1 psi, the approximate peak overpressure of a 20kt bomb fired 2½ miles away.

Collapse of the roof at lesser distances would coincide with the arrival of the shock front, and would cause the further collapse of that portion of the tank not filled with water. It was felt that some metal below the water line would also give way because of the tendency of creases to carry through homogeneous welded construction.

Loads resulting from wind, earthquake and atomic blasts are dynamic loads. When any dynamic loading is applied to an elastic structure, it results in structural movement or vibration.

Designs which will resist dynamic loadings, therefore, involve the evaluation of vibratory effects, and a study of the co-action of applied forces and the natural period of structural vibration.

Resistive Methods

In general, there are two ways to resist forces of the magnitude encountered in atomic blasts: *(1)* either the structure must be strong enough to resist such forces without plastic yielding, or *(2)* the structure must be so designed that certain replace-

able members will yield plastically and absorb a much larger amount of energy than they could by elastic deformation only.

Several construction changes and additions which would eliminate the structural weakness of the tank roof were proposed by Pittsburgh-Des Moines researchers.

These changes (inner stiffening members and an increase in the size of the roof vent) would have enabled the roof to withstand a 20kt atomic blast at a ground-zero distance of only one mile. But at this point two additional elements—foundation resistance and diagonal wind rods—would weaken and become limiting factors.

Even with a better-than-usual foundation and greatly reinforced wind rods, the tower could not withstand the external pressures of a blast at a ground-zero distance of less than a mile. This is due to the fact that all other elements of the construction would then become critically weak areas.

Maximum Sway: 24 In.

To prevent overstress on the tower columns, maximum sway under blast pressure should not exceed 24 in. Conventional tower designs *would* allow such a sway at a distance of 3,400 ft from ground zero, where peak overpressure would be about 13 psi. But the difficulty and expense involved in necessary reinforcements preclude the use of standard towers.

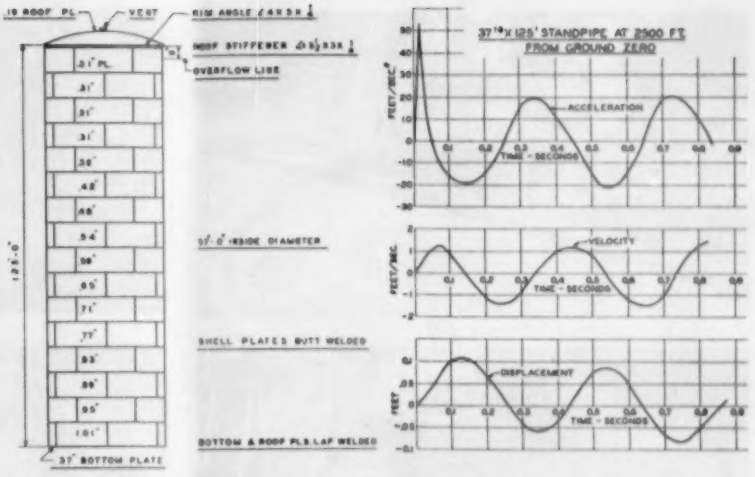
At a distance of 3,300 ft, standard column piers would probably be stable.

In strengthening existing structures, then, principal attention would be given to stiffening tank plates—particularly the thinner roof plates—to better withstand external overpressures, and/or provide means by which net external pressures may be reduced to safe values.

More data than is presently available will be needed to properly determine exact reinforcing requirements.

Similar Limitations

The blast resistance of standpipe and reservoir structures was also studied by the investigation team, which included J. O. Jackson, vice president, and H. E. Lindberg, chief design engineer of Pittsburgh-Des Moines Co., and Professor W. C. Alsmeyer of Iowa State College.



LEFT: Conventional 1,000,000-gal standpipe, with adequate vent and capacity load, might withstand 20kt atomic blast at a distance of 1 mile. RIGHT: Chart indicates stresses placed on standpipe by blast occurring 2,500 ft away. Maximum displacement at yield point was 0.116 ft; maximum displacement in first oscillation, 0.1 ft. So far as vertical bending is concerned, standpipe could theoretically withstand blast pressures

They concluded that roof structure was again the major limiting factor, but that the wide variety of roof types would necessitate separate investigation. Preliminary calculations indicated, however, that some standard-size standpipe structures would resist blast forces at a ground center distance of one mile from a 20kt explosion.

These calculations provided for a water-filled standpipe, or one whose interior was almost instantly accessible to blast forces. Provisions would also have to be made for absorption of shock energy to prevent the standpipe's overturning at this distance.

This would be accomplished through yielding anchor bolts, or by a foundation so constructed as to tip or slide.

Resistant Design

The final design prepared by the investigators was an elevated tank of average size and height. On the basis of available information, it is felt that this tank would resist overpressure and drag forces and remain in service at a ground center distance of ½ mile from a 20kt atomic bomb blast.

To accomplish this feat, a spherical tank was designed to better resist external pressures, and the tubular columns were of minimum diameter to reduce drag forces.

Sway rods have a far greater cross-sectional area and foundations are much larger than those for a tower conforming to the conventional wind or earthquake design.

The claims for this new design have been based on the assumption that the elevated tank or standpipe would be substantially full at the time of the blast. Absence of a large mass of stored water would reduce absorption of blast energy and cause the structure to overturn after a much shorter exposure to blast forces.

The investigators admit in their report that inadequate information concerning blast pressure diffraction around the structure, and magnitude and distribution of drag forces has necessarily prevented them from arriving at exact conclusions.

They believe, however, that their assumptions are within 50% (plus or minus) of the correct intensity and distribution of the forces involved. It is probable that the estimates of drag forces are more nearly correct than those of diffraction pressures.

The relative importance of drag forces in the strength of the structure is fortunately greater; that is, an error in the intensity or distribution of diffraction pressure would probably have less effect on stability than a correspondingly large error in the distribution or intensity of drag forces because of the extremely short time of application of diffraction forces.

TOP: Badly bent steel "I" beam might be scrapped under normal circumstances. BOTTOM: Following proper heat application in chalk-marked area, beam has resumed normal shape with no loss of strength.

TOP: Fully loaded truck was involved in a head-on collision and had frame bent 15 in. out of line vertically, and 8 in. horizontally. BOTTOM: Contraction has pulled frame back to proper alignment.

Flame-straightening: a friend in need

By the contraction method, the author maintains, a lot of bent steel members could be put back into useful operation. This is Part I of a two-part article. It will be concluded in a future issue.

BY JOSEPH HOLT

USE of the oxyacetylene flame in performing difficult—even seemingly impossible—tasks in steel work is often underestimated. There are many jobs that beginners as well as old-timers pass up because they are not acquainted with the advantages offered by contractive forces which set in after heat has been properly applied.

The "contraction method" will always help in straightening bent steel members, or in bending steel members for fabrication. The author has used this method to straighten power shovel booms, dipper-sticks, heavy structural members, steel bridge portals, batter-posts, wind-braces and cords without removing them from their original positions.

Other bridge parts also have been repaired in place with no traffic hold-up. The contraction method has been used to straighten truck-frames, truck-body sides and tail-gates, sills, cross-members and countless other steel articles.

The process is applicable to all steel shapes. So far, however, it has received little attention from the average weldor—a man who should find it of great value in everyday work.

Heating, generally, causes or relieves stresses, and often changes the structural characteristics of metal. Careful study will aid any operator in using heat to great advantage as he applies it in welding or in any

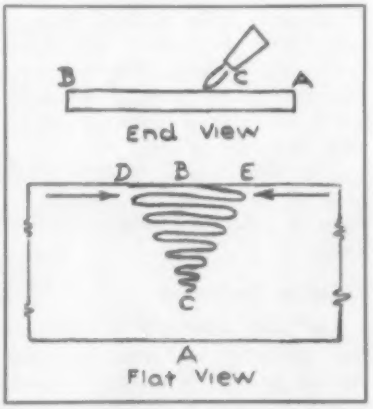


FIG. 1—Two views of the heat application method by which a steel member can be straightened through contraction.

This article is based on a book copyrighted by the author in 1938.

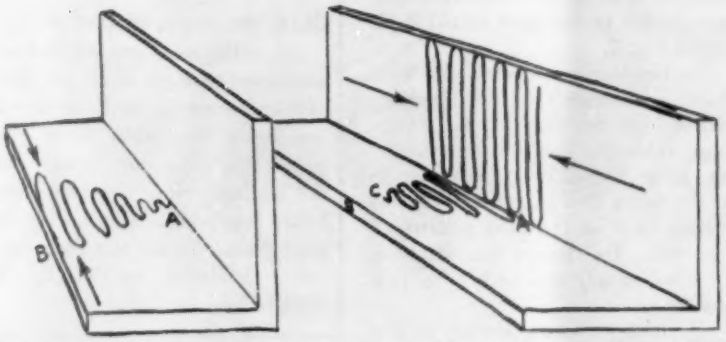


FIG. 2—Angle-bar (left) can be straightened by striking heated portion a few blows with a hammer. Ends of the angle at right, if the member is heated in the manner shown, are pulled toward side A as metal cools.

special application. He may soon find himself doing many profitable jobs with nothing more than a good oxy-acetylene torch and ordinary gases.

Experimental Learning

The electric weldor also should take this method into consideration if he wants to get the best results from his efforts. A weld improperly applied will cause trouble if stresses are wrong and are left unrelieved.

The beginner must start with simple experiments and develop this method, step by step, to a wise and workable art. It is often stated that steel contracts on cooling as much as it expanded on being heated.

This is true in volume, but not in alignment or length if heat is properly applied.

When we speak of heat "pulling" the steel, we must remember that properly applied heat only forces the metal to "upset" (or expand into itself), and that contraction as the metal cools is the force which pulls it towards the desired point.

Each "heat", on cooling, will pull only a certain distance. Therefore, if a great amount of change is required in alignment, the work can be hastened and costs lowered by adding some outside force while the metal is hot.

Methods of Application

Steel expands or contracts in a definite ratio to each degree of temperature change. A reasonably accurate scale allows for an expansion or contraction of ⅛ in. per foot of heated metal, if this metal receives the amount of heat necessary for a blacksmith's forge weld.

The method of applying heat must be such that steel, instead of expanding in length, will expand into itself. To make this method work, there must be portions of the member cold enough, strong enough and so situated as to force "inward" contraction where heated unless outside force can be added.

As an example, we will use a flat bar ¼ in. thick, by 2 in. wide, by approximately 2 ft in length (Fig. 1). Using a fair-sized tip, heat this bar about ½-in. from edge A with the flame pointed slightly toward edge B.

The flame is held steady until this point attains a light-red heat. The surface is never melted. When spot C has been heated, a progressively wider heating path is started toward edge B, where heating is finished. When the specimen cools, note that it has pulled edge-wise toward the widest part of the heat.

This is what happens: metal at A and B is cold, but at C the flame heats it rapidly and forces it to expand. Since A and B are rigid, the metal can only expand into itself. This inward expansion continues to a greater extent as the heated area widens toward edge B.

As the flame moves from point C, the metal at that point drops in temperature. It becomes more rigid and does not re-stretch. As it contracts with the temperature drop, however, it assists in upsetting the hotter metal at the torch tip.

Gaging the Bend

The widened heat pattern and the contracting metal behind it upset edge B, which does not re-stretch but contracts on cooling so that the bar is bent edge-wise. The amount of bend is determined by the width of the "V" heated.

Point A should not be heated beyond the temperature created by conductivity of the metal. In other words, the cooler point A is, the better. This point acts as a hinge and the vee-shape of the heating pattern allows an equalization of stresses.

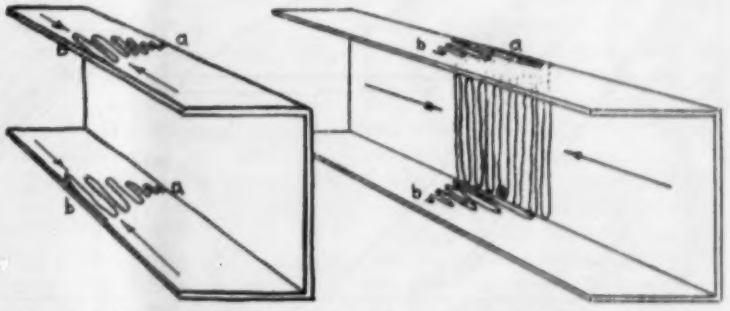
When the bar has cooled and its change in alignment is noted, the procedure is reversed. Heat is laid down in a vee-form from B to A and the bar on cooling will be straight if both heats have been equal.

The bar, however, will have shortened considerably, indicating the results which can be expected from broader shortening and tightening applications on metal left in place in large structures.

A piece of angle iron (Fig. 2), ¼-in. thick with legs 2 in. wide and 2 ft long, is treated in the following manner:

Leave one leg cold and start at point A to heat the other leg in the same manner as the bar in Fig. 1. The same results will be achieved.

If this angle is to be straightened,



FIGS. 3 and 4—Heating channel iron flanges only (Fig. 3, left) will bend channel away from webb on cooling. The reverse of this result (Fig. 4, right) can be obtained by heating the webb in addition to the flanges.

reverse the heating procedure done on the bar. When the cold leg is reached, heat rapidly a narrow strip as wide as the widest part of the heated area on the other leg.

Contractive Forces

In Fig. 2 (right), the heat starts at C and widens as the torch moves toward side A. The upright leg of the angle is then heated as indicated by the lines. This pulls the ends of the angle toward side A as the metal cools.

The angle in Fig. 2 (left) also can be straightened by stretching the portion heated. This is done by placing it on a heavy piece of steel and striking the heated part a few blows with a hammer, or by holding a sledge on one side and using a hammer on the other.

This stretches the metal and accomplishes a result opposite from that caused by heating metal properly and letting it cool.

Now let us try a piece of channel iron (Fig. 3), heated only on the flanges. Leaving the web cold, and starting from that side, widen the heat as the outer edges are approached. The cooling flanges contract and bend the channel away from the web.

Channel-Iron Bends

To bend the channel toward the web (Fig. 4), start heating at a point near the edge of the flanges and progress in an ever-widening vee toward the web. When the web is reached, it should be heated in a manner similar to that used on the angle leg in Fig. 2.

In bending a channel edge-wise, leave one flange cold. Start heating the web at the base of this flange, and widen the heat on approaching the other flange. Heat this flange its entire width to a length equal to the widest part of the heat pattern on the web. To change the direction of bend, simply reverse heating procedure.

Using a procedure similar to that used on a channel-iron, the web of an I-beam to be bent side-wise (Fig. 5) is heated to the same width as heats on the flanges where they join the web.

To bend an I-beam edge-wise (Fig. 6), leave flanges cold on one edge of the web. Heat the web in a vee-shape starting close to the flanges, and widen the heat as you move toward the other flanges. When these flanges have been reached, heat them so that the entire heat is in the form of a "V" from start to finish.

Vee-Shaped Heating Pattern

On a job demanding a bend or alignment change greater than those described in the foregoing experiments, it is advisable to add some outside force to upset the metal while still hot.

If it is impossible to add such a force, let the member cool and then re-heat it. Repeat this process until the desired bend or alignment change is obtained.

Between pages 66 and 67 . . .

. . . in this issue, you will find an addressed card on which you may make comments and criticisms concerning our 1955 Fact File Issue. We know our listings are not perfect. How can we make future improvements that will help you? Please fill out this card and return it today to WELDING ENGINEER.

It must be kept clearly in mind that heat throughout the section or member to be bent or straightened must be in a vee-form from one side or edge to the other. Whether the piece is a unit or a lamination, this must be done to eliminate internal stresses occurring during contraction.

Noting the action of each piece of steel in these experiments, you will see that the widest part of the heat pattern on the member has necessarily been on the side to be shortened. If heat is to be applied to straighten a bent member, the widest part of the heat must be on the convex side of the bend.

These experiments must be made to get a thorough and sure knowledge of the exact action which will take place when metal cools after proper heating.

Direction of heat application and rate of torch travel are vital considerations. Be sure you are right before you start to heat!

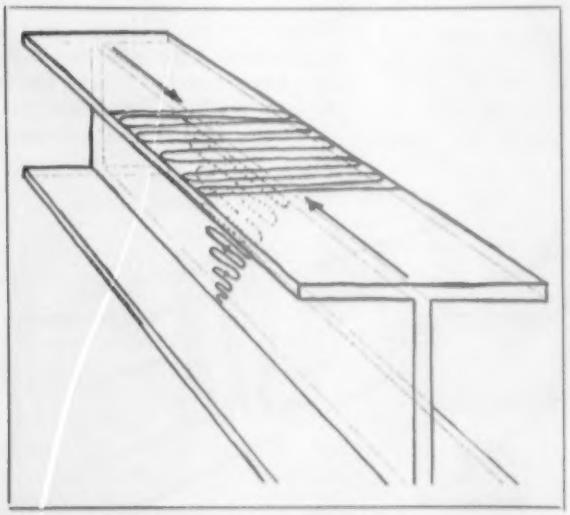


FIG. 5—Webb of an I-beam to be bent side-wise is heated to the same width as the heats on the flanges where they join the webb.

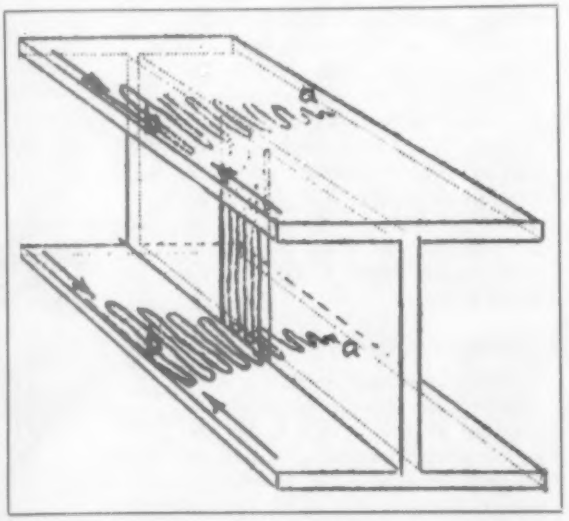


FIG. 6—In bending an I-beam edge-wise, heat webb in a vee-shape toward one set of flanges, then continue heating on flanges.

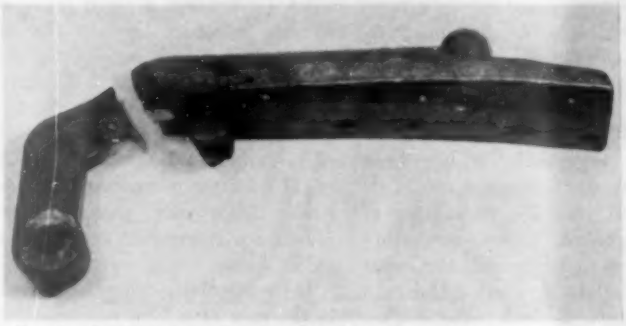


Fig. 1—Broken zinc alloy bracket for outboard motor

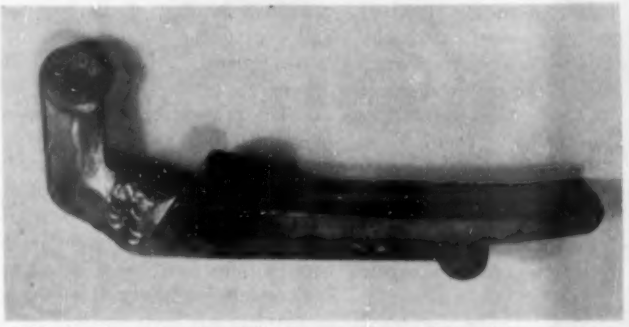


FIG. 2—Same bracket following repair by Tig welding process

FIG. 3—Thin alloy section is cut from carburetor

FIG. 4—Neat Tig weld is made without disassembly

Tig welding zinc alloys

BY LLOYD JOY*

INCREASED use of die-cast components in modern mass-production has resulted in a demand for a simple and controlled method of weld repair, especially for zinc alloys.

Accepted practice has been to weld these alloys by means of an oxyacetylene or oxyhydrogen flame. However, thermal conductivity of the metal and its fluidity when molten necessitated the use of supporting molds formed to the contours of pieces to be joined.

This welding technique required careful regulation of heating to avoid harmful oxidation of the metal. Welding of zinc die-castings by the oxy-gas method, therefore, was very erratic, and largely dependent on the shape of the article and skill of the operator.

Pressure exerted by juvenile Lone Rangers whose die-cast six-guns failed at the crucial moment, and heavy-handed car owners whose door handles and horn rings just seemed to fall apart, resulted in the initiation of a lunch-hour project to discover a better method for welding these parts.

The Tig (tungsten inert-gas) process offered greatest possibilities of success. Limited experiments were made using direct current, with straight and reverse polarity, none of which proved successful.

However, when alternating current with superimposed high-frequency stabilization was used, very promising results were obtained.

Motor Bracket Repair

Fig. 1 shows one of a pair of brackets used to hold an outboard motor to a boat. Both of these brackets broke in the same general area. Dimensions of the section at the break were approximately 5/8-in. thick by 1-in. wide.

The same bracket after repair is shown in Fig. 2. The Tig process and a commercially available white-metal welding rod was used.

Application of this welding technique to thin sections is shown in Figs. 3 and 4. In the former, a section has been cut from a discarded carburetor. Fig. 4 shows this same carburetor with the section welded into position.

Precise control obtained with the Tig process is evident from the uniform bead size and the fact that this repair was effected without disassembling the carburetor.

Use of the Tig process to join chromium-plated car trim is shown in Fig. 5. It will be noted that only very slight damage is caused to plating when the repair is made from the unplated side.

The process has also been used to weld broken car-door handles, horn

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rings, toy revolvers, typewriter parts, and the weed guard of an outboard motor.

Welded Fabrication

It is felt that the Tig process could be adapted to the manufacture of components which, because of their shape, cannot be cast as a unit. As an example, it should be possible to cast two halves of a ball or cylindrically shaped container and join them by means of Tig welding.

Equipment required to do the work is similar to that used in welding aluminum. An argon-shielded, tungsten electrode torch is connected to an a-c transformer equipped with a high-frequency generator.

Two types of transformers are used, one with a standard open-circuit voltage and superimposed high frequency. The other is a balanced-wave transformer with 123 volts open-circuit voltage and low-frequency, pulse-type stabilization.

The latter seemed to provide better control, but both machines were found to be suitable.

Weld preparation consists of veeing the edges to a chisel point to provide an included angle of from 90 to 120 deg. In the case of thick sections, a wider angle is necessary to permit easy access to the root face.

Where finish is a consideration, as in the case of chrome-plated car trim, bevelling should be done from the unplated side. An 0.04-in. tungsten electrode is used with the argon flow set at approximately 5 cfh.

Amperage Range

In our experience, it has been found that the amperage range is between 15 and 25, regardless of metal thickness. Where very thin sections are to be joined, the lesser setting should be used. Above a thickness of ⅛ inch., the higher setting will be preferable.

A smaller diameter filler wire would be preferred to the standard 3/16-in. cast rod now available. However, this difficulty was overcome by sawing the cast rod down the center to make two rods.

No back-up mold is required to support the weld. Some minor oxidation occurs along the underside of the bead, causing slight lack of flow. It is felt that this is not a serious drawback in ordinary repair welding.

If necessary, it can be corrected where possible by welding from both sides or, if complete penetration from one side is required, by flooding the underside of the weld with an inert gas.

A very short arc is held and small stringer beads are deposited. Because of the short arc, the torch must be moved slightly from side to side in order to melt the filler material and fuse it into the sides of the groove.

The maintenance of a short arc is not as difficult as in the welding of aluminum, because the molten metal does not contaminate the electrode. After each pass, the weld must be wire-brushed to remove the oxide film.

On particularly heavy sections, or in the case of a long weld on a thin section, it is necessary to control the welding sequence in order to avoid overheating of the base metal and consequent sagging.

In general, zinc die-cast alloys appear to be quite weldable, using the Tig process with a-c, high frequency. It has not been possible to determine the composition of the alloys used in this work, but it is felt that in welding a wide variety of parts, most of the popular alloy compositions have been encountered.

Complete investigation of the procedure has not been possible because of the limitations of time and material. However, it is hoped that sufficient information has been provided to guide those who are interested in the welding of zinc die-cast alloys.

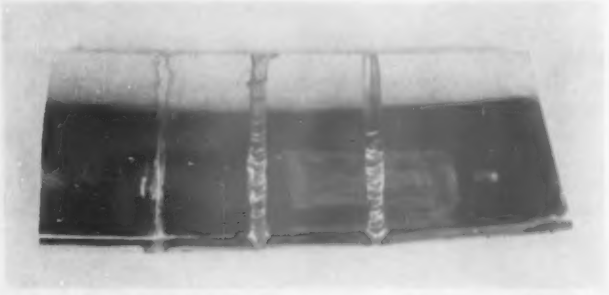


FIG. 5—Chrome-plated car trim is Tig welded on plated side. Note 3 stages of work

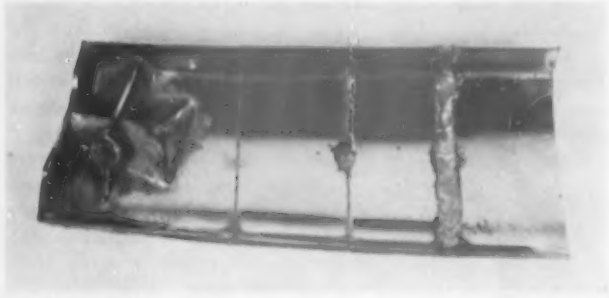
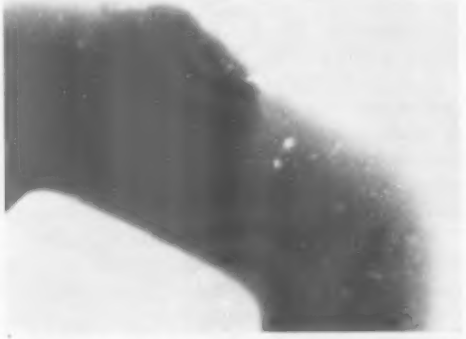
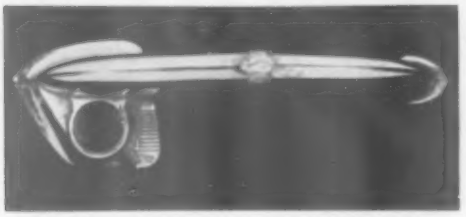


FIG. 6—Only slight damage results from welded repair on unplated side of car trim

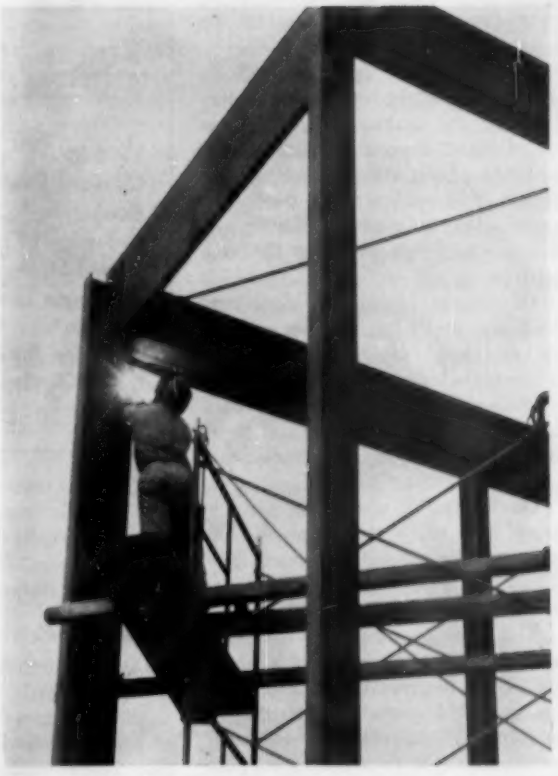


X-RAY clearly indicates greater density of weld metal in bracket repair shown on previous page



WELDED repair of car-door handle is neat and strong. Horn rings and typewriter parts are among other things which can be repaired

Filler metals for joining



WELDOR uses E6012 electrodes in work on new all-welded Institute of Design building at Illinois Institute of Technology. Roof suspended from welded plate girders above building is novel feature here

The most popular electrode presently on the market is the E6012. In this fourth article in a series, Author Barnett gives you the reasons leading to this popularity—as well as the reasons which soon will drop the E6012 from its pedestal.

BY ORVILLE T. BARNETT*

ALMOST two manual arc welding electrodes out of every five are of the E6012 type. Today, these electrodes are the most popular in the E60—mild-steel group.

Yet, in a way, E6012 electrodes are the ugly ducklings in the arc welding electrode family because they are cold, general purpose, poor fit-up electrodes with low ductility. And they give very gassy, multilayer deposits.

The days of the E6012 electrode as the most widely used grade are numbered. A lusty, iron-powder counterpart (E6024 in the new AWS-ASTM *Specifications for Mild Steel Arc Welding Electrodes*) is now fighting its way to the top.

Still, the E6012 is going to be attractive for a good while yet, and its many advantages merit recognition.

Performance-wise, E6012 electrodes have a quiet, stable arc, little spatter, and good slag coverage that leads to a finely rippled, attractive bead. Penetration is slight to medium, but adequate. This limited penetration leads to the use of E6012's on low alloy steels and re-rolled rail stock.

The weld bead does not pick up enough alloys or carbon to crack. If heat input is great enough to protect parent metal from cracking during cooling, E6012 electrodes often perform well in services where low hydrogen E—16 types might otherwise be needed.

High Deposit Rates

When E6012's are spoken of as cold, poor fit-up types, two characteristics are involved.

With a relatively light coating, these electrodes permit high currents —¼-in. E6012 at 300-amp average, against ¼-in. E6010 at 250-amp average—which cause high deposit rates, even on comparatively light plates. The metal deposited is viscous, sets-up well and permits gaps to be easily bridged.

Some electrode manufacturers make one type of E6012's, while others list as many as three or four different types. Even though all of these E6012 brands meet specification requirements, some will be better in specific applications than others.

Usually, the salesman can point out his most popular type when he offers more than one. The others, hotter or colder, have certain types of structures on which they display performance advantage.

Thus, short and numerous skip welds on automobile frames call for a somewhat different coating than long runs of lap fillet welds on the bottoms of huge storage tanks.

Most E6012 electrodes have a tan color that comes from rutile (natural titanium dioxide), a major coating ingredient. Rutile explains why E-6012's and some stainless steel electrodes are often spoken of as rutile or titania types.

Silicious materials, such as feldspar and clay as slag formers, celulose for some gas shielding, ferromanganese as a deoxidizer, and silicates as binders, complete the formulation of the coating.

Good on a-c or d-c

Present-day styles of E6012 electrodes do a good job on d-c straight and reverse polarity, and on a-c. Excellent a-c arc stability is provided by potassium chemicals or by potassium silicate in the binder to introduce

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potassium ion stabilization in the arc.

There are certain groups which do not approve of the low as-welded ductility or the multi-pass weld porosity of E6012 deposits. If all buildings or bridges built with E6012 electrodes were to fail suddenly, the destructive power of the most advanced hydrogen bomb would appear puny by comparison.

Of course, E6012 bridges and buildings won't fail. Neither will the freight cars, farm implements and automobile frames welded with them. The mechanical properties reported in Table I are adequate, and there is plenty of service life evidence to prove this point.

Obviously, it would be nice to know how much elongation the designer really needs. He's gone from 22% in 2 in. to 17%. Can he go to 12%, 7% or 2%? No one knows.

The same questions may be asked about porosity. How much is harmful? Does the repair of slightly porous welds improve or impair the quality of the whole weldment? Someone ought to supplant supposition with facts.

Ductility and Soundness

At any rate, ductility and soundness levels of E6012 welds appear adequate. It should be pointed out that single-pass welds with E6012 electrodes are completely sound, and that most welds made with this electrode *are* single pass.

Mild or structural grades of steel usually are welded with E6012 electrodes. But certain low-alloy structural grades in the 70,000 psi strength ranges can be welded, too, since most E6012 weld deposits will match or exceed the yield and ultimate strength of such steels.

Everything from sheet metal to sections ½-in. thick or more may be welded with E6012's. They operate well in all positions. Vertical position fillets are quite convex at the start but flatten out as additional passes are made.

Once again, NEMA figures provide an excellent clue to use patterns. For lighter gage fabrications, $\frac{5}{32}$-in. and $\frac{3}{16}$-in. diameters represent 49% of all E6012 electrodes deposited. The ⅛-in. diameter adds another 10%. But the $\frac{7}{32}$-in., ¼-in. and $\frac{5}{16}$-in. diameters comprise about 35% of all E6012 consumption.

Here is really high-speed production. In the horizontal fillet position, for example, a $\frac{5}{16}$-in. diameter electrode reportedly produces 45 ft of finished $\frac{5}{16}$-in. fillet weld per hour at a 100% duty cycle.

TABLE I
TYPICAL MECHANICAL PROPERTIES OF E6012 ELECTRODES
AS WELDED

Yield Strength, psi	57,000-68,000
Ultimate Strength, psi	71,000-82,000
Elongation, % in 2 in.	17-25
Reduction of Area, %	35-45
Impact Strength, Izod ft-lb	25-50
Endurance Limit, psi	25,000-30,000
Specific Gravity, grams/cc.	7.82-7.86
Corrosion Resistance	Comparable to mild steel
X-Ray Quality-Single pass	Good to Excellent
-Multiple passes	Fair

Downhill Welding

On oil storage tanks of moderate capacity, speeds of this nature are regularly achieved through the use of turning rolls by tank shop weldors. These weldors realize the advantage of welding downhill to string out the bead and permit the use of higher currents.

Most E6012 electrodes have refusable slags—i.e., each layer of a string-beaded fillet weld can be cleaned of slag, instead of each bead. Leaving the slag in place improves the final fillet contour and reduces cleaning costs.

Properly deposited E6012 beads leave little spatter along seams. When anti-spatter compounds are applied prior to welding, a light wire brushing, or a quick once-over with a power-driven wire wheel will economically prepare surfaces for painting.

Many anti-spatter compounds are good paint primers. Usually, a short arc will reduce the amount of spatter.

Economy Factors

Wherever single-pass fillets on ⅜-in. or lighter plate are specified, E6012's ought to be used. When specifications demand a different class of weld metal, the other type required *must* be applied.

But every weld not governed by limiting specifications ought to be done with the E6012 group. On lighter plates, there is no question that best looking horizontal fillet welds are made with this electrode. There is no undercut; there is almost no spatter; and the slag, once it has cooled, separates cleanly and easily.

Production economies with E6012's come from three important factors: *(1)* high currents and large-diameter electrodes on relatively light base metal; *(2)* ease of handling without undercut or burn-through; and *(3)* d-c, straight-polarity operation.

From light-gage sheet metal to thin plate ranges, E6012 electrodes pile up cost-saving speeds. The electrodes will permit high currents. Very narrow, neat-appearing beads can be deposited.

If straight seams are employed for downhand butt welding, welding 30 deg downhill will often permit the weldor to use an electrode one size larger in diameter. This results in a significant increase in completed weld as measured in feet per hour.

With E6010 and E6011 electrodes (see WELDING ENGINEER for June, 1955, p. 30, and for August, 1955, p. 30), undercuts along the upper edge of a horizontal fillet weld awaited the unskilled weldor. But E6012's produce horizontal fillets that cannot be undercut—even if the weldor deliberately tried to do so. That's why welding neophytes frequently are started on jobs calling for E6012 electrodes.

Similarly, in sheet metal welding, inexperienced weldors are plagued with burn-throughs. Without warning, the seam drops away. No such exasperating experiences occur when the same man uses E6012 electrodes.

The viscous weld metal sets-up quickly, and the narrow bead used with d-c straight polarity satisfactorily limits heat input into the joint. Also, the downhill welding characteristics of these electrodes speed up sheet metal welding.

TABLE II
TYPICAL DEPOSIT ANALYSIS OF E6012 ELECTRODES

Element	Percentage
Carbon	.07-.10
Manganese	.30-.40
Phosphorus	.016-.030
Sulfur	.020-.035
Silicon	.30-.40

The E6012 group, as originally developed, operates to best advantage with d-c straight polarity. Wherever welding conditions permit, this combination of current and polarity ought to be used.

Straight Polarity Type

If magnetic blow is not a factor, and there are plenty of welded joints where blow is non-existent, d-c with straight polarity will deposit the greatest amount of weld metal of any possible combination of current and polarity.

With the same number of amperes, d-c with reverse polarity will deposit the second greatest amount of weld metal; and at the same amperage, a-c will deposit the smallest amount of weld metal. It is sometimes possible, however, to use 10% more current with a-c than with d-c, which serves to eliminate some production rate disadvantages associated with a-c.

All considerations involved in the joint should be kept in mind. Use d-c with straight polarity for utmost refinement in operating practice.

If the gale-like forces of magnetic blow toss the weldor off-course, by all means use a-c. (Electrode designers merit considerable praise for the excellent a-c characteristics they have built into the E6012 coatings in recent years.)

Or if d-c reverse polarity is the only setting available, as may be the case in shipyards or shops where constant-potential generators continue to feed a number of welding stations, use that combination with confidence.

Cold Electrodes

Just as cold weather means one thing to a fur-clad Eskimo, and quite another to a Bikini-clad miss at the seashore, so does the term "cold electrode" possess various connotations for different coating designers and electrode users. A few E6012 electrodes on the market are very cold.

The deposits are markedly convex, porosity tends to be high (even for this type of electrode), and elongation flirts with the lower specification limit. Other electrodes are more fluid and possess a minimum of convexity, the least possible amount of porosity, and more than the specified level of elongation.

The former may be faster, permitting greater current to be applied to them, while the latter, though somewhat slower, may permit the deposition of a better-looking bead. Sometimes only the "hotter" E6012's produce readily refusable slags.

Variations in interpretation of the term "cold" may account for noticeably different values of physical properties. Both ductility and tensile strength depend upon the coating used. Strengths may vary as much as 7,000 psi as a result of coating composition, though in all cases tensile properties are well above specification minimums.

Ranges in physical properties depend upon yet another factor—electrode diameter. Invariably, tests made with ¼-in. electrodes show lesser strength and greater ductility than do comparable tests made with $\frac{5}{16}$-in. electrodes.

Wide Current Choice

In Table III are presented recommended ranges for current and voltage as applied to E6012 electrodes. There is a tremendous spread from the low to the high value of current recommended for a particular electrode diameter. However, E6012's permit a wide choice of current values.

On thin metal, lower current reflects the decreased heat-absorbing capacities of the base metal, while on plate sections the coating stability establishes the upper current limit.

How well does the coating stand up for a half minute or so to core-wire temperatures approaching 1,500 F? The answer lies in bead appearance. Reaction pits and surface holes will be found at the finishing end of a bead when the coating breaks down due to excessive heat.

Thus it is the heat-proof (short-time condition only) quality of certain E6012 coatings, demonstrated by sound welds produced under very high current conditions, that make possible the phenomenal speed records they have established under production conditions.

Principal applications of E6012 electrodes include structural welding, farm equipment, automobile frames, truck bodies, storage tanks, freight cars, gas furnaces and heating boilers. That's where the greatest tonnage goes. But E6012's are so widely used that a list of additional applications would run into the thousands.

It is too early to tell how much E6012 territory will be taken over by E6024 electrodes. The lighter gage applications are sure to be unaffected.

The economic battle will be fought in the heavier sections, where the smoke will soon clear and welding engineers will use each type to its best advantage.

REFERENCES

Manufacturers catalogs

Tentative Specifications for Mild Steel Arc Welding Electrodes (AWS Designation A5.1-48T; ASTM Designation A233-48T), June 7, 1948

Welding Handbook, American Welding Society, 3rd edition, 1950

TABLE III
SUGGESTED CURRENT RANGES FOR E6012 ELECTRODES

Electrode Size			
Diameter (in.)	Length (in.)	Amp	Volts
3/32	12 or 18	25-90	17-21
⅛	14	55-140	18-22
5/32	14	100-200	18-22
3/16	14 or 18	140-275	20-24
7/32	18	170-350	20-24
¼	18	200-425	20-24
5/16	18	250-500	22-26
⅜	18	300-575	28-31

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Page A-S-20	Page A-S-6150
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Page-Allegheny A-S-Type 348	
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Stainless Steel Metal Spray	According to AWS Analysis

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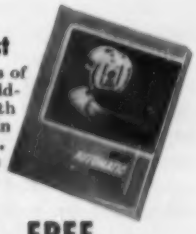
• Whenever you are in need of automatic welding wire, electrodes or welding rods, you can get them quickly and easily from your nearby PAGE Distributor—no matter what part of the country you live in.

PAGE Distributors carry ample stocks from which your requirements can be filled without delay or inconvenience to you. This handy service not only saves you time in getting what you need, but makes it unnecessary for you to make a sizeable investment in inventory. Thus, your nearby PAGE Distributor is able to make double savings for you—a saving in time and a saving in actual dollars.

Get the full Analysis List

All the 26 analyses of PAGE Automatic Welding Wire are set forth in complete detail in new **Folder DH-402.** A free copy of this informative folder will be sent to you on request. Write to our Monessen, Pa., office.



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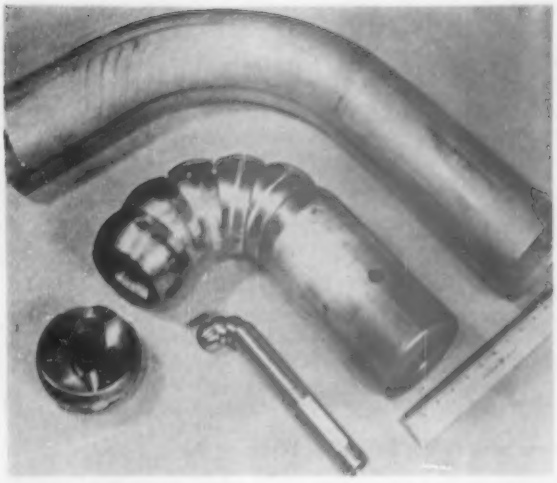


FLEXIBLE steel mandrels, used to bend all sizes of thin-wall stainless tubing, are hardfaced with aluminum-bronze at points of wear and presently save the aircraft industry $14,000 per plane.

MANUFACTURER of pulp presses for food, paper and rubber industries found aluminum-bronze hardfacing application on cast-iron "flights" of screw-type spindle greatly increased their service life.

ALUMINUM BRONZE:

Overlays that halt surface wear

BY F. E. CARRIOTT
Ampco Metal, Inc.

METAL-on-metal wear robs industry of millions of dollars annually.

At a great savings to industry, however, service life of machine parts, old and new, is now being increased as much as 5,000% through the arc-welding application of aluminum-bronze overlays on wearing surfaces.

These alloys are a series of engineered, closely-controlled aluminum bronzes in the form of electrodes and filler rods producing bearing and wear-resistant deposits ranging in hardness from 130 to 380 Brinell (3,000 kgr load). Hard bronze alloys can be applied by the metal-arc, carbon-arc, Tig (tungsten inert-gas), Mig (metal inert-gas), and submerged-arc processes.

Their success in combating wear is due to an unusual metallurgical structure which consists of fine, hard aluminum-iron particles backed up by a soft matrix of aluminum bronze.

Uses for hard aluminum-bronze deposits are innumerable since they are used to hardface such items as bearings, bushings, sheaves, idlers, gears, pinions, sprockets, cams, valves, shafts, pistons, and many others.

In the production of new equipment, for example, Pines Engineering Co. of Aurora, Ill., developed a machine for bending all sizes of ultra-thin-wall stainless steel tubing.

$14,000 Savings

An aluminum-bronze hardfacing, applied on the cast wiper dies and fabricated steel mandrels used in this machine, is presently saving the aircraft industry an estimated $14,000 per plane.

Pines Co. has stated that the bronze wiper dies and mandrels successfully resisted pick-up under the tremendous drawing pressures required for this precision bending job.

Another critical problem was encountered by Jackson & Church Co. in the manufacture of pulp presses for the food, paper, rubber and other processing industries.

It was solved, again, through use of aluminum-bronze hardfacings applied with the metal arc process.

Engineers with the Saginaw, Mich., firm found that aluminum-bronze on the edge of new cast iron "flights" on a screw-type spindle which revolves inside a close-fitting outer screen has greatly increased the life of these flights.

Metal-Arc Application

Hardfacing is applied with the metal-arc process after flights have been welded to the press spindle. These flights are subsequently placed in a lathe and ground to proper dimensions.

One of the most extensive uses for aluminum-bronze hardfacing electrodes is in the fabrication of composite drawing and forming dies. Lee Manufacturing Co. of Royal Oak, Mich., specializing in the forming of stainless steel moldings for automobiles, use such fabricated dies to eliminate pick-up, scratching and galling on wearing surfaces—thus producing a better product at lower cost.

Several years ago, Lee engineers, after extensive tests, found that SAE 1020 steel, hardfaced with aluminum-bronze, produced dies that would withstand wear and friction under high pressures.

It also produced quality moldings with less rework, and dies with longer life than tool steels.

Under present-day business conditions of high production, high maintenance and replacement costs in the face of keener competition, drastic economies can be made in many ways through the proper use of welding with aluminum-bronze hardfacing electrodes and filler rods.

Long-life Inconel basket for heat-treating service is easily fabricated by Wiretex Mfg. Co., Inc., Bridgeport, Conn. Wiretex uses "132" Inconel Electrodes in 3/32-inch diameters. The "132" comes in handy 14-inch lengths, 5 diameters: 3/64 and 3/32-inch (both center grip) . . . 1/8, 5/32 and 3/16-inch (each end grip).

Welds made quickly and easily with "132" Inconel Electrodes stay strong, resist corrosion in 1650°F. neutral salt bath

On the job, Inconel heat-treating baskets like this one ride a "jack rabbit" conveyor. They make a continuous cycle: 40 minutes in a neutral salt bath at 1650°F., then an oil quench . . . washing, drying . . . and the cycle starts again.

After six months of *24 hour* service these Inconel baskets welded with "132" Inconel Electrodes are still in good condition. One reason is because the "132" weld metal matches the Inconel base metal so closely . . . not only in appearance, but also in *high temperature strength and corrosion resistance.*

You get faster and better welding with new ready-to-use "132" Inconel Electrodes

You can use Inco's *new* "132" Inconel Electrodes right from the container to obtain X-ray quality, corrosion-resisting welds in Inconel. *No rebake is needed,* because of the *new,* durable flux coating and core wire. You get a high rate of deposition, smooth bead contour, stable arc in all positions, and easy slag removal.

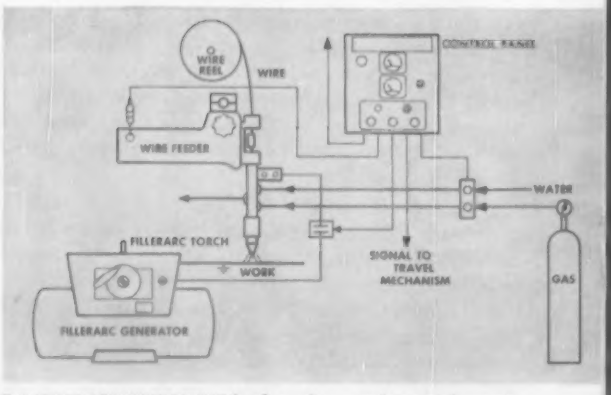
Your local Inco distributor has the *new* "132" Inconel Electrode in stock. Order a 5-lb. package today. And for an up-to-date source of welding information, write for the newly revised edition of our *Welding Bulletin, T-2.*

Moisture-Resistant sealing tape gives extra protection to the *new* "132" Inconel Electrodes. 5-lb. tubular containers have metal ends and asphalt lining for added protection.

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street — New York 5, N. Y.

INCO TRADE MARK **Welding Products**

Electrodes • Wires • Fluxes



G-E FILLERARC EQUIPMENT is the only complete equipment especially designed for consumable-electrode gas-shielded welding. Simplicity of the system makes possible use of less expensive fixtures and greater over-all efficiency.

NEW G-E Automatic Welding System Uses CO_2 to Slash Gas Costs 95%

FILLERARC . . . first *complete* equipment designed especially for automatic gas-shielded welding; combines unique generator with low-cost carbon dioxide—for sound welds on mild steel.

General Electric's new Fillerarc Automatic Welding Equipment brings you—not only 95% savings in shielding-gas costs—but *sound welds on mild steel.* The great savings possible through use of CO_2 as a shielding agent have long been recognized—but good mild steel weld quality has never been obtained. Now, after two years of successful application of Fillerarc equipment on non-ferrous metals (using inert gas), G-E engineers bring you the total solution for mild steel welding—*savings plus high quality.*

95% SAVINGS ARE POSSIBLE because CO_2 costs only *1/20th* as much as inert gas. For the average job, Argon would cost $5.00 per hour, CO_2 only twenty-five cents. This means yearly savings per equipment may be as high as $20,000 on a 3-shift, 60% duty cycle basis. This new G-E system can now replace the submerged arc method on many jobs and eliminate many of the problems associated with granular flux.

EXCLUSIVE G-E GENERATOR practically eliminates the erratic weld quality formerly obtained with CO_2. Here's why: Only the G-E Fillerarc generator—with its exclusive *rising* volt-ampere characteristic— supplies an arc length which always remains constant, even with adjustments in wire speeds. This means minimum weld porosity and spatter—and deep penetration for extra-strong welds.

COMPARED TO OTHER INERT-GAS SYSTEMS, G-E Fillerarc equipment . . .

- Reduces gas costs 95%, for yearly savings up to $20,000 per equipment;
- Delivers consistent weld quality because of the unique G-E Fillerarc generator;
- Assures constant speed; system is insensitive to normal line-voltage changes;
- Provides wire-feed speeds as high as 1000 I.P.M.

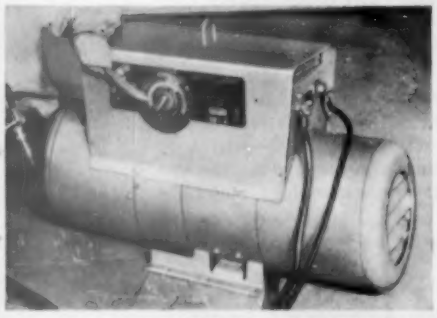
COMPARED TO FLUX-SHIELDED METHODS, G-E automatic Fillerarc equipment . . .

- Deepens penetration with low-cost CO_2;
- Provides a visible arc for full control of weld quality, permits less expensive fixtures;
- Does not use abrasive flux—especially important in welding compressor housings and similar jobs;
- Eliminates stubborn flux slag; cleaning costs are greatly reduced;
- Eliminates expensive flux recovery systems.

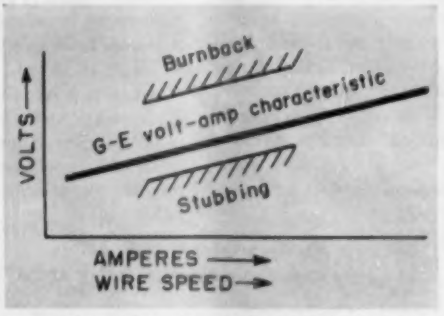
FOR MORE DATA contact your G-E welding sales engineer—and write for bulletin GEC-1334 to Section 713-1, General Electric Co., Schenectady, N. Y.

SEE G-E automatic Fillerarc equipment demonstrated at the National Metal Exposition, Philadelphia, October 17–21.

Why the complete G-E system makes possible quality mild-steel welds with CO_2



G-E SELF-REGULATING GENERATOR is the heart of the Fillerarc Automatic Welding system. Unique rising volt-amp curve maintains constant arc length.



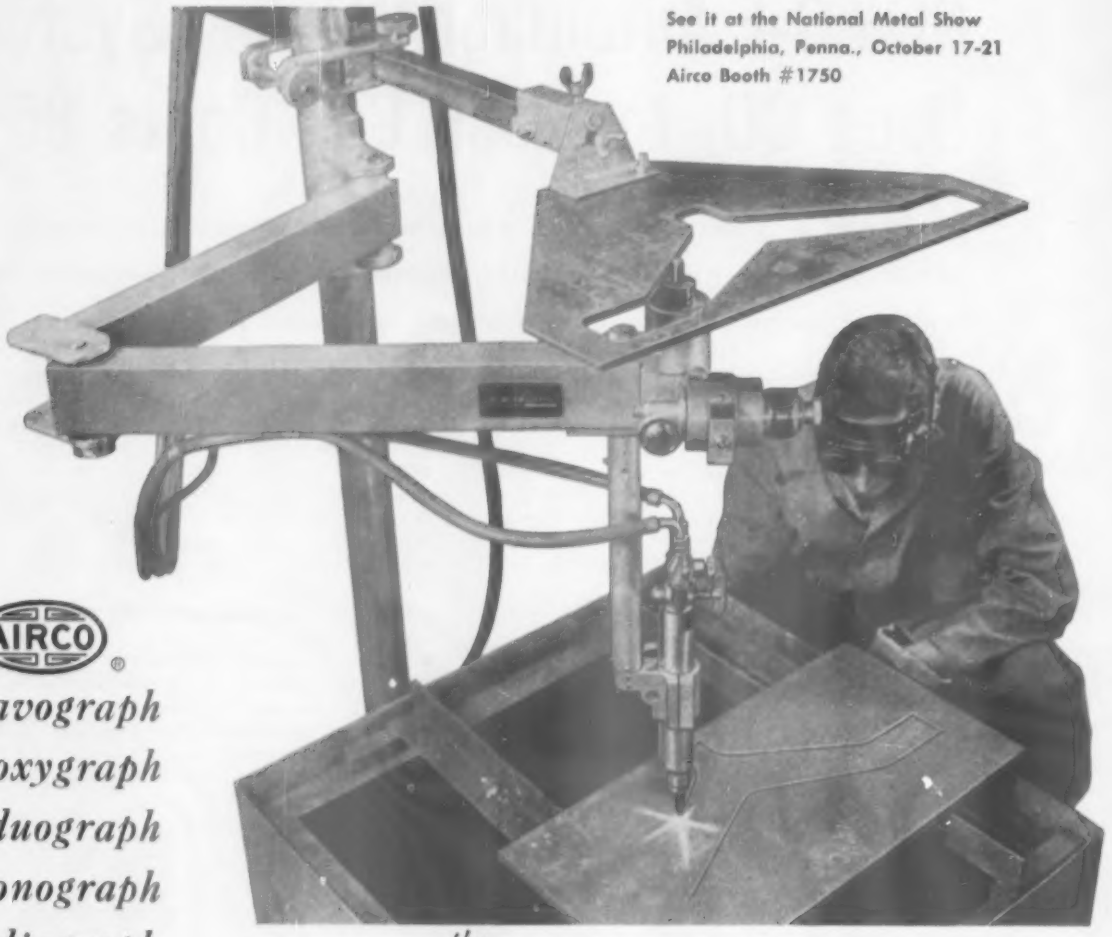
RISING VOLT-AMP CURVE of the exclusive G-E Fillerarc generator matches rising arc curves . . . does not get into area of burnback and stubbing. Resulting high weld quality is uniform.

DEEP PENETRATION is produced by short arcs and faster wire speeds typical with Fillerarc equipment. Above: weld on semi-killed steel.

Progress Is Our Most Important Product

GENERAL ELECTRIC

See it at the National Metal Show
Philadelphia, Penna., October 17-21
Airco Booth #1750



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and now the

NEW #42 CAMOGRAPH

for repetitive, accurate shape cutting!

The new Airco #42 Camograph is a low-priced, accurate, shape-cutting machine which can be used as a major production tool to turn out thousands of *identical* flame-cut parts – or – as an auxiliary unit to supplement the output of larger, more expensive machines. Here are a few of its many features:

- **Cuts any shape** up to a *full* 42" diameter circle – straight lines to 92".
- **Accommodates wide range** of tip sizes to shape-cut steel of any practicable thickness.
- **Tracer head is permanently magnetized**—operated by an adjustable speed motor.
- **Portable**—move it from location to location, easy to set up and level.
- **Unerring Accuracy.** Permanently magnetized tracer hugs steel template. Knurled roller follows most intricate shapes at constant speed – driven by adjustable-speed, governor-controlled motor through *positive* worm-gear drive – no couplings, pulleys or belts.

See your Airco representative for full details – or—write Airco direct. Request catalog ADC 853.

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Divisions of Air Reduction Company, Incorporated, with offices and dealers in most principal cities
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Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** – industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** – carbon dioxide, liquid-solid ("DRY-ICE") • **OHIO** – medical gases and hospital equipment • **NATIONAL CARBIDE** – pipeline acetylene and calcium carbide • **COLTON** – polyvinyl acetates, alcohols, and other synthetic resins.

TRADE NAMES* OF ELECTRODES AND COMPARABLE AWS-ASTM DESIGNATIONS

Designation	E-4510	E-6010	E-6011	E-6012	E-6013	E-6014†	E-6016	E-6020	E-6024	E-6027	E-7010	E-7020
Weld positions	V, F, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	H-Fillet, F	H-Fillet, F	H-Fillet, F	V, F, OH, H	H-Fillet, F
General Description / MANUFACTURER	Wire—coating applied before drawing	Heavy coated D-C pos.	Heavy coated A-C or D-C	Heavy coated D-C neg. or A-C	Heavy coated A-C	Iron Powder A-C or D-C	Low-hydrogen D-C pos. or A-C	H. coated A-C or neg. for fillets, A-C or pos. for flat	Iron Powder A-C or D-C	Iron Powder A-C or D-C for flat, A-C or neg. for fillets	Heavy coated D-C pos. only	H. coated A-C or neg. for fillets, A-C or pos. for flat
Air Reduction[1]	41 or 63	78E or 78	230	87 or 387	90 or 90A		312	81 or 315	Easyarc		93	94
Champion	Sulcoat	Blue Devil	Bluedac	Gray Devil Gray Devil 2 Gray Devil H.P.	Graydac Tan Devil	Speed Devil 14	Hy-Lo		Speed Devil 12		Blue Devil 85	Black Devil 75
General Electric		W-610A	W-612A W-612B W-612C W-612D	W-613A				W-620A W-620B W-620C W-620D	Strikeasy 1		W-710A	W-720A
Harnischfeger	Washcote	AP-3	AC-1	PF or PFA	AC-3	DH-6	70 LA-2	DH-2 or DH-3	DH-5			
Hobart	Sulcoat	10	335	77 or 12	447 or 313		16	111	Rocket 24	Rocket 27	885	111-HT
Lincoln	Stal-le-Arc	Fleetweld 5 Lightweld	Fleetweld 35	Fleetweld 7	Fleetweld 37 or 47 Planeweld 2	Improved 47	Shieldarc LH-70	Fleetweld 11	Jetweld 1	Jetweld 2	Shieldarc 85	Jetweld 2HT
Marquette		105	130 or 140	120	151			115	Marq-Rod 12			
McKay	21	15	11	17 or 116	24		Pluralloy 70AC	16	Jetarc			
Metal and Thermit[2]	Sulcoat	Type R	Type A	Genex Genex M Genex C Genex D	Type U or Alternex		Type HTS	Type FHP or Type D	Speedex		Molex	Type DM
National Cylinder Gas	Sureweld 308	Sureweld B or BP	Sureweld CB	Sureweld N, G or NM	Sureweld CN or CE		7016	Sureweld FD	Sureweld 24	Sureweld 27	Sureweld MLY-50	Sureweld MLY-A
Reid-Avery[3]	D or Blue Label	7	11	8	13		6016		6024	6027	74	64
Shober Sales		32	33	34	35			66				
A. O. Smith		SW 10	SW 14	SW 12 or 17	SW 15 or 16	SW 46	SW 65	SW 35	SW 44	SW 45	SW 75	SW 76 or 78
Westinghouse	18 Sulcoat	AP or XL-610	ACP	FP or FP-2	SW or SW-2		LoH-2	DH	Zip 24	Zip 27	AP-MO	DH-MO

*Trade name or Type No. is usually prefixed by company name.

†Not as yet a recognized standard by American Welding Society.

V = vertical, F = flat, OH = overhead, H = horizontal, H-Fillet = horizontal fillet. [1]Airco prefix. [2]Murex. [3]Raco prefix.

POSITIVE LOCK!

JUST LIKE THE

cam-lok

CABLE CONNECTORS

- Exclusive Cam-Action!
- Locks Tight!
- Stays Tight!
- No Spring Action!
- Releases Easily!

Exclusive Cam-Lok design guarantees positive, vibration-proof connection. Locks tightly in about ½ turn. No spring tension, no weaving or moving of contact surfaces, therefore, no arcing, burning, or freezing.

COMPARE POSITIVE LOCK and these CAM-LOK features with your present connectors:

1. **High Pressure** contact eliminates overheating and current losses.
2. Connects instantly, all cables from #2 to 4/0 **without adapters and without tools.**
3. **Self-compensating** for wear, self-cleaning.
4. Fiber insulation pin, arcing impossible.

"QUICK-DISCONNECT" ELECTRODE HOLDERS

Obsolete all others!

Eliminate need for whips and whip end!

CHECK THESE FEATURES:

- Eliminates need for carrying whips.
- Holder plugs in quickly and easily to any cable merely by attaching holder handle to cable end.
- Less money tied up in cables.
- No electrician and no tools required to change holders.
- Holder and jaws insulated with tough, heat-resistant fibre glass.
- High pressure positive lock.
- Offset jaws eliminate rod bending.
- Offset holder permits burning rods to shorter stubs.
- Choice of offset or straight jaws.

Write for Bulletin No. 121

cam-lok

DIVISION OF EMPIRE PRODUCTS, INC.

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Visit us at Booth #1827 at the METAL SHOW, Oct. 17-21, Philadelphia

WELDOR removes slag after applying the first of two layers of hardfacing alloy to a forge press die. Bead runs longitudinally over die face

A new face toughens forge dies

A METHOD of hardfacing the top and bottom faces of forging press dies from a 1,000-ton press reportedly has increased their normal service life from 4 to 18 times.

The press in which the dies are used at the Sanderson Halcomb Works, a division of Crucible Steel Co., forges high-speed tool and alloy steels. It also handles special high-alloy compositions for high-temperature service applications, as well as titanium and titanium alloys.

Due to the nature of materials being forged, the faces of these dies are subjected to unusually severe service conditions involving high-temperature deformation, oxidation, thermal shock and abrasion.

Die blocks normally were made of a tungsten-bearing austenitic stainless steel, designed for high-temperature service. These dies, however, withstood an average of only 8 to 24 production hours before the surface of the die marred the billet and imposed considerable difficulty in holding gage.

At this point, they were removed, planed to a new surface and returned to service. This was repeated until the successive planing operations had reduced the thickness below permissible minimum height. It was then necessary to manufacture new dies.

Hardening for Longer Life

In view of the great expense involved in this procedure, it was decided to investigate the use of a hardfacing alloy in developing a composite, long-life die.

In forging an 11-in. billet of molybdenum high-speed steel, it was observed that the bottom die attained a surface temperature in excess of 1,500 F in four minutes of operation. Resistance to deformation in this temperature range, therefore, was a primary consideration.

In addition, the hardfacing material had to: (1) retain adequate abrasion resistance; (2) be relatively non-scaling, and (3) absorb thermal stresses with a minimum of heat checking.

A special low-hydrogen coated electrode finally was selected for trial use in hardfacing a set of experimental dies. The electrode was a non-ferrous alloy of chrome, cobalt and molybdenum specifically designed for high-temperature service.

Using standard composition, a new pair of dies was made. The center of the die faces (approximately 120 sq in.), where wear usually is concentrated, was cut to a depth of ¼-in. below finish dimensions. Preheated to approximately 600 F, the dies were hardfaced with ¼-in. electrodes.

Two Layers of Weld

Hardfacing was applied longitudinally in two layers to a height roughly 1/16-in. above finish dimensions. An interpass temperature of 300 F was maintained throughout the welding operation.

Twenty pounds of electrodes were used per die. The dies were allowed to cool normally before being surface ground.

Placed in the press, the experimental dies served for a continuous period of 92 hours. During this run, 155,000 lb of metal were forged, 80% of which were so-called "super alloys." Under normal conditions, the quantity of super alloys in any one production run would comprise only about 30% of the total.

At the end of 92 hours, the press foreman reported a slight depression visible in the die faces. Both dies were removed to take advantage of the ease with which the depression could then be rebuilt by hardfacing.

The extended life of the hardfaced dies, at this point, totalled roughly 400%.

Processing for the second hardfacing application began by gouging out fire checks with a cutting torch. The grooves were then filled to a point ⅛-in. below finish dimensions with a stainless steel electrode.

Reduced Shrinkage Stresses

The original low-hydrogen electrodes were used to fill the balance of the grooves, and to make a final pass over the depressed area. All weld metal deposited in grooves was peened to relieve shrinkage stresses. The dies were then surface ground and restored to their original condition.

After returning to service a second time, the experimental dies completed *432 hours* of continuous production, forging 741,440 lb of metal.

This tremendous increase in service life was attributed by Sanderson engineers to elimination of the weld metal—parent metal dilution factor by hardfacing a second time.

By application of this process, Sanderson reduced the cost of manufacturing new dies to a minimum, since dies in service can be resurfaced many times at relatively low cost.

It also succeeded in eliminating an average of 12 to 14 complete change-overs in every 432-hour period—a total savings of from 33 to 38 man-hours.

—Photos courtesy Crucible Steel Co. of America

FORGE press die after 92 hours of continuous production use at Sanderson Halcomb Works, Syracuse, N.Y. Dark area in center indicates point of greatest wear which will be rebuilt by second hardfacing application

ELECTRODES GIVE BETTER RESULTS AND SAVE YOU MONEY!

Arcair electrodes enable you to realize the full performance and economy designed into your Arcair torch. No substitute electrode will perform as well or give as much value as genuine Arcair carbon-graphite electrodes. Arcair electrodes employ a special compound of carbon and graphite, developed and processed especially for use with the Arcair torch. This unique blending of carbon and graphite results in an electrode with the best qualities of each material, as well as superior arc stability. Recent tests proved the average life of an Arcair electrode to be *36% better than a popular competitive grade, yet Arcair costs about one half as much!*

Arcair superior carbon-graphite electrodes are available in plain or copper-coated types in sizes 5/32" to ⅜" in diameter. Special metal electrodes are also available for exceptional requirements of cast iron and copper alloy work. We want you to prove the money saving features of these electrodes ON YOUR OWN WORK! Write us for FREE SAMPLES of Arcair electrodes, try them at no charge, and you will quickly see why YOU CAN'T AFFORD NOT TO USE THEM! With your FREE ELECTRODES, we'll send complete details of these finer electrodes, along with additional test data.

WRITE FOR YOURS TODAY!

ARCAIR COMPANY
427 South Mt. Pleasant Ave.
Lancaster, Ohio

Arcair TORCH
Cuts all metals—using only electric arc and compressed air

Q. What controls the quality of consumable electrode welding?

A. One big factor is the quality of the electrode used.

Q. How can you be sure of getting the best electrode?

A. By insisting on Alcoa's new I.G.* Electrode.

Q. Why?

A. Every production lot of Alcoa® I.G. Electrode is test welded and the welds X-rayed for soundness. Each 10-lb spool is individually packed to maintain the super-smooth finish to assure soundness of weld and smoothness of feed. Each of five alloys, 1100, 4043, 5154, 5254 and 5356 (formerly 2S, 43S, A54S, B54S and XC56S), is available in six diameters. There is no better electrode.

*inert gas

Your guide to aluminum value

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A new, 176-page text, *Welding Alcoa Aluminum*, has just been released by Alcoa. It covers every phase of welding in complete detail. For a free copy, fill in and mail the coupon.

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Pittsburgh 19, Pa.

Gentlemen: Please send book, *Welding Alcoa Aluminum*.

Name_____

Company_____

Title_____

Address_____ City_____ State_____

Q. Where is Alcoa's new I.G. Electrode available?

A. Contact your nearest Alcoa sales office, or, for immediate delivery, call one of the Alcoa Distributors listed below. He carries a complete range of alloys and sizes, and you'll find him well qualified to work with your welding experts.

ALBANY, N. Y.
†Eastern Brace-Mueller-Huntley, Inc.

ATLANTA, GA.
†J. M. Tull Metal & Supply Co., Inc.

BALTIMORE, MD.
Whitehead Metal Products Co., Inc.

BIRMINGHAM, ALA.
†Hinkle Supply Co.

BOISE, IDAHO
Pacific Metal Co.

BUFFALO, N. Y.
Brace-Mueller-Huntley, Inc.
Whitehead Metal Products Co., Inc.

CAMBRIDGE, MASS.
Whitehead Metal Products Co., Inc.

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Edgcomb Steel Co.

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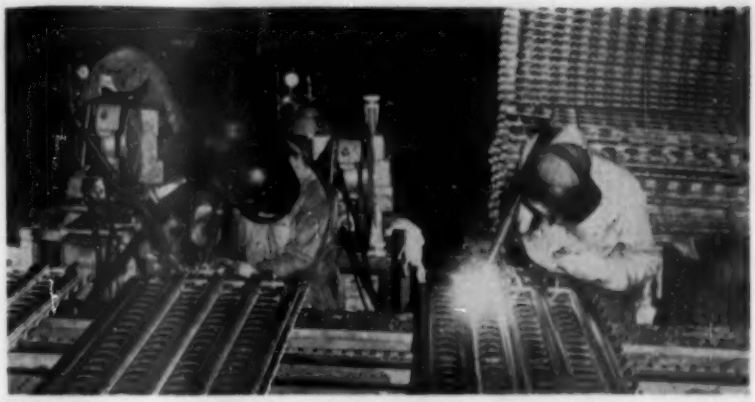


MIG weldors begin work on aluminum landing mats. After change-over, process may also be used to finish steel mats

Short jobs for Mig

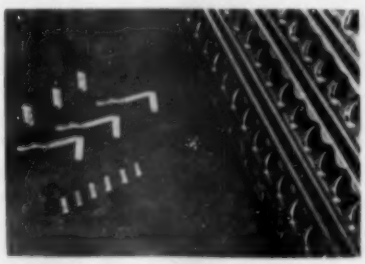
BY R. A. STONE
Air Reduction Sales Co.

IN THE fabrication of both steel and aluminum landing mats for the U. S. Army Corps of Engineers, the production performance of J. S. Thorn Co., Philadelphia, offers an outstanding example of fast volume welding with the Mig (metal inert-gas) process.

On this project, production at Thorn alternates between steel and aluminum mats which are similar except for the metals. For example, production is given over to steel mats, and then, after a change-over period, production is concentrated on aluminum mats.

With extensive facilities for forming and punching sheet material into the specified landing mat design, Thorn finishes the job with the Mig welding process—turning out between 2,400-2,800 mats each day.

With this process, the company produces at very high speeds small, perfectly shaped welds hour after hour. About 40,000 small welds are made each day. Each weld is a ¼-in. fillet approximately ½-in. long.



FULLY formed sheet with 12 small pieces to be welded on by Mig process

The welds on both steel and aluminum have been of consistently high quality—smooth craters, no cracks, no slag or flux, no porosity. Moreover, the mats accept paint in the as-welded condition.

The work at Thorn on the steel mats is said to represent one of the first major production jobs on steel with Mig, which pioneered originally in the welding of thick, structural aluminum.

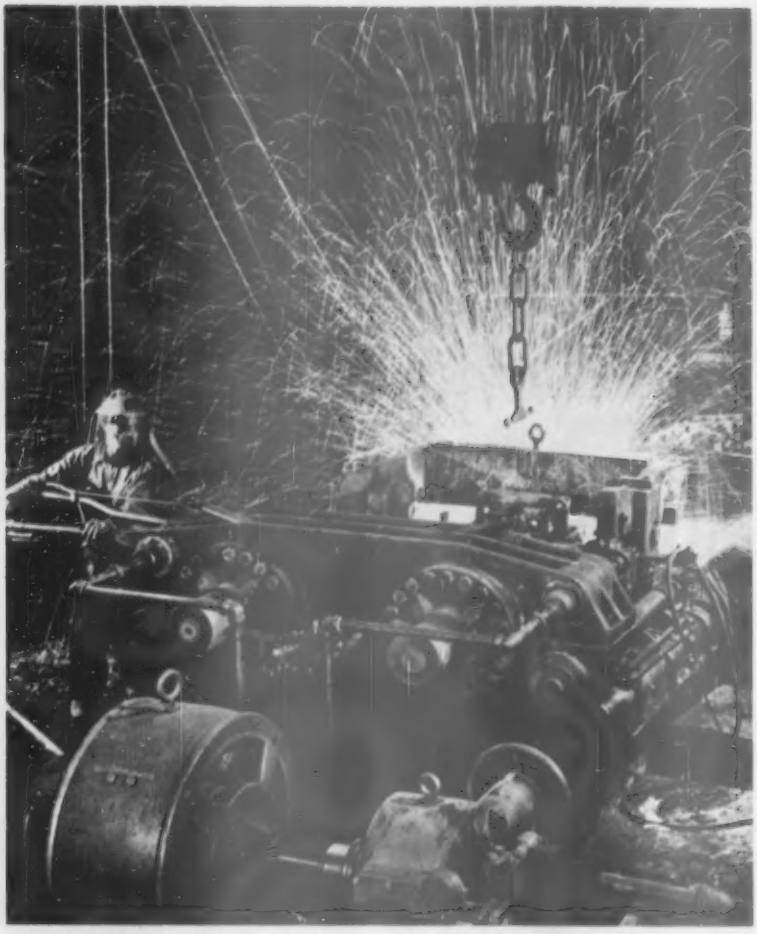
Through the use of the inert-gas shield, the need for flux is eliminated and there is no slag removal. This saves what would be a large cleaning expense. Any adherence of welding slag would only cause failure or rejection in the field.

It is interesting to note that, in a given month at the Thorn firm, there were shipped 52,000 steel landing mats (or 62 railroad gondola carloads). These mats would make a "lay down" of 1,066,000 sq ft.

To accomplish this production, Thorn used 8,500 lb of welding wire and 33,000 cu ft of argon gas.

Welding conditions for both steel and aluminum mats are:

	Steel	Aluminum
Wire	1/16 in.	1/16 in.
Base metal	AISI 1010	61S-T6
Gage	10 gage	0.135 in.
Amperes	250	200
Gas	argon and oxygen	argon
Gas flow	40 cfh	40 cfh



FLASH welder, which will handle any joint size up to 36 sq in., throws a shower of sparks as operator applies pressure.

EXPANDING APPLICATIONS

New uses are a tribute to welding

BY JOHN L. LANG*

IN THE last 25 years, welding has come of age. No longer is it something new. The welder today is the symbol of modern industry. If all welding were to stop suddenly, practically every industry using mechanical operations, production or maintenance would come to a standstill within 90 days.

Less than 40 years ago, welding was a process used principally in the blacksmith's shop. Today, without exception, every metal fabricating industry uses welding.

It is difficult to realize that this universal application of welding has occurred only during the last 10 years. Today, when a new metal is discovered or a new alloy developed, one of the first questions asked about it concerns its weldability.

The word "welding," as used here, is a general term. The American Welding Society's "Master Chart of Welding" lists some 37 separate processes, only a few of which will be discussed here as particularly suitable for production work. These include the shielded metal-arc, submerged arc and the Mig (metal inert-gas) and Tig (tungsten inert-gas) processes.

Spot, seam, projection and flash welding will be discussed under resistance welding processes.

It is said that "nothing is new under the sun," but we will consider welding applications that must be termed "new" because they have been instituted only in the last few years.

Shielded Metal-Arc Welding

Manual, shielded metal-arc welding is a process wherein coalescence is produced by heating with an electric arc between a covered metal electrode and the work. Shielding is obtained from decomposition of the electrode coating. No pressure is used and filler metal is obtained from the electrode.

The welded steel Diesel engine frame is not very new. The welded *stainless steel* Diesel engine frame, on the other hand, *is* a new application.

Stainless is used for its non-magnetic properties. Eight-cylinder upright, and eight and twelve-cylinder V-type engine frames were welded at Lukens with E308-15 electrodes. Parts were fabricated of type 304-18-8 stainless steel cut and formed from rolled plate.

Bearing housings were drop forgings of the same material. Several hundred 8 and 12-cylinder stainless frames have been fabricated for the non-magnetic mine sweeper program.

Fabrication of Columns

Comparing an old, cast-iron Diesel engine and a modern, welded steel Diesel engine would indicate that the welded engine represents a reduction of 67.39% in cu ft occupied per bhp, and a reduction of 58.40% in weight per bhp. Imagine what it would have meant to produce a non-magnetic frame of the

*Welding engineer, Lukenweld Division, Lukens Steel Co., Coatesville, Pa. This article is based on a paper presented by the author at a meeting of the American Society of Mechanical Engineers.

old style!

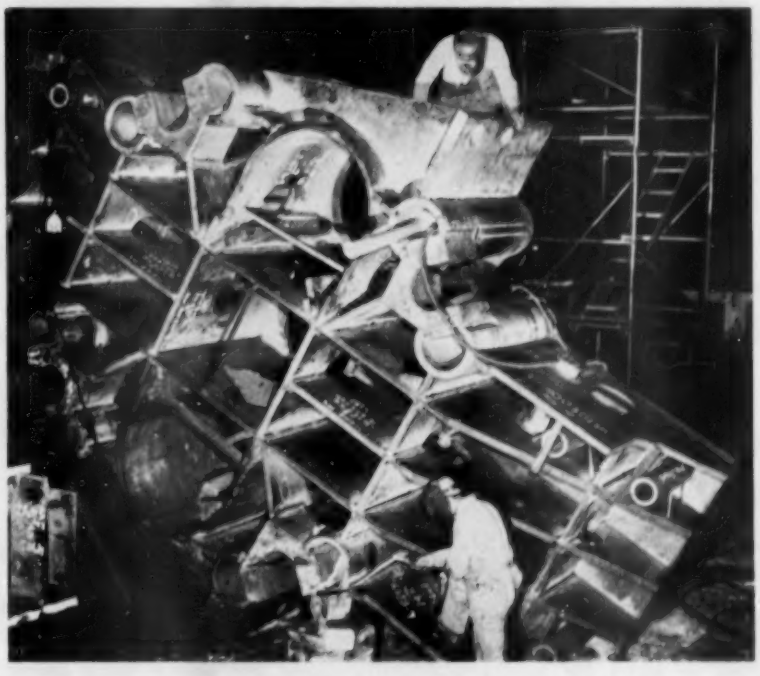
Another example of manual welding at Lukens can be found in the work done on two columns fabricated for the 3,000,000-lb extrusion stretcher recently placed in service at the Lafayette (Ind.) Works of Aluminum Co. of America.

The columns are each 130 ft long and weigh approximately one ton per ft. One is straight, and the other has sufficient camber to straighten out when supported at each end.

An automatic flame-cutter cut 36 holes in each of the 4-in.-thick column side members. Location of the holes was critical, and had to be determined after complete fabrication. A procedure was formulated to keep distortion at a minimum.

The complete machine is 180 ft long and is capable of stretching a 120-ft length of AA7075 extruded aluminum with a cross-sectional area as large as 60 sq in. Maximum width the stretcher can accommodate is 37 in.

Still another application of shielded metal-arc welding is the fabrication of large power plant weldments. Low-pressure turbine cases are fabricated entirely of rolled plate, then they are gas-cut, machined, formed and welded. Large stator frames are fabricated in the same manner from plate stock, and welded into a homogenous mass.



AUTOMATIC flame-cutter slices easily through 4-in.-thick walls of column for aluminum extrusion stretcher. BELOW: Giant end frame for extrusion stretcher, partially completed, is fabricated entirely with welding.

Submerged Arc Welding

Submerged arc welding produces coalescence through heating with an electric arc between a bare metal electrode and the workpiece. The welding is shielded by a blanket of granular, fusible material on the work. No pressure is used and filler metal is obtained from the electrode and sometimes from a supplementary welding rod.

Two very large presses presently are being constructed at Lukens. Most of the welding on the main structures was done by the submerged arc process.

Large beams on the presses have 12-in.-thick butt joints of double "U" design welded with the multipass submerged arc process. Crossbeams for the 50,000 and 35,000-ton presses have 8½-in.-thick butt joints in 70,000 psi tensile steel which required approximately 100 weld beads.

Over 1,000 lb of weld wire were used in each joint. The structures were preheated to 350 F and kept at or above that temperature during the welding operation. These presses are to be used for fabrication of aircraft components.

A submerged arc process is now applied to high-speed production of automobile chassis frames in a large Eastern plant. Welding is done in the horizontal position on 0.093-in.-thick low-carbon material. The joint is a lap with the outside edge up.

The machine is fully automatic, with six welding heads which track in three planes at a speed of 150 ipm. Two such units, working two eight-hour shifts, produce 1,400 frames per shift or 2,800 per day. Floor-to-floor time per frame is roughly 30 seconds. The units do the work formerly handled by 40 manual arc weldors.

The Tig process utilizes an inert gas, helium or argon, and a tung-

sten electrode. Filler metal is fed into the arc, or the joint is designed in such a manner that edges are melted down and no filler metal is required.

Tig Welding Process

A machine automatically welds stainless steel, hermetically-sealed aircraft contactor cases by this process. This welder traverses irregular circumferential contours, automatically holding the arc length and a linear welding speed constant during the full 360 deg rotation, then tapering current to zero to avoid craters.

A nesting fixture mounted in a retracting breech-block facilitates rapid loading and unloading of work parts. Welding electrode position has accurate, stepless adjustment which can also be made during welding. Completely automatic machine sequence has a stepless, variable-speed drive and automatic shut-off.

In the consumable electrode process, as the name implies, the electrode is fed into the arc and is consumed in the weld as filler metal. This process has greatly facilitated welding of aluminum, copper and its alloys, stainless steel, and titanium.

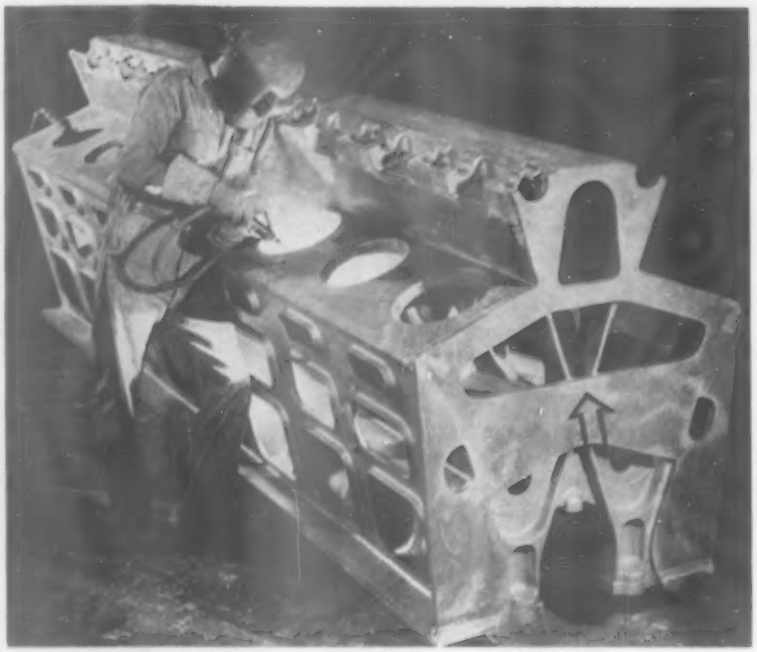
One of the earlier applications of this process to mild steel at Lukens was the fabrication of refrigeration compressor cases of five hp size. Sixty units were assembled, welded and tested for an 8-hour shift. Two Mig units were used in welding the 110 in. in the three main joints of each case.

Resistance Welding Processes

Spot, seam and projection welding are a group of processes wherein coalescence is produced by heat obtained from resistance of the work to electrode current flow in a circuit of which the workpiece is a part. It is also obtained by application of pressure through electrodes.

In spot welding, size and shape of individually formed welds are limited primarily by size and contour of electrodes. For example, circular electrodes will be used in seam welding. The resulting weld is a series of overlapping spot welds made progressively along a joint by rotating the electrodes.

Projection welding gives welds which are localized at predetermined points by the design of parts to be welded. Localization usually is accomplished by projections, embossments and intersections.



SIXTEEN-cylinder Diesel engine, to be installed on mine-sweeper, is fabricated of stainless steel because of metal's non-magnetic properties. Welding is used throughout.

"Range" Welding

In 1932, a refrigerator had a cabinet frame of wood with metal panels screwed in place. Welding was still untried as a production tool. Some welding was used a year later on the refrigerator shell and liner, but on a limited scale. The 1955 refrigerator, however, displays extensive resistance welds in every major assembly.

The story of the electric range is much the same. Welding formerly was confined to simple spot welding on the frame, top, cover and drawer. All welding was done on standard spot and gun welders using simple fixtures. Production rate was very low.

The 1955 range has an entirely new look. Beneath the gleaming porcelain and chrome are 235 individual pieces that are joined together by 1,150 spot and projection welds.

The amazing part of it is that these 1,150 welds required slightly less than one hour of productive labor as determined from time studies. This time includes handling of all parts as well.

Think of the time it would take if these parts were riveted, screwed or even fusion welded together. This is proof of the effect of a resistance welding process in high-speed production.

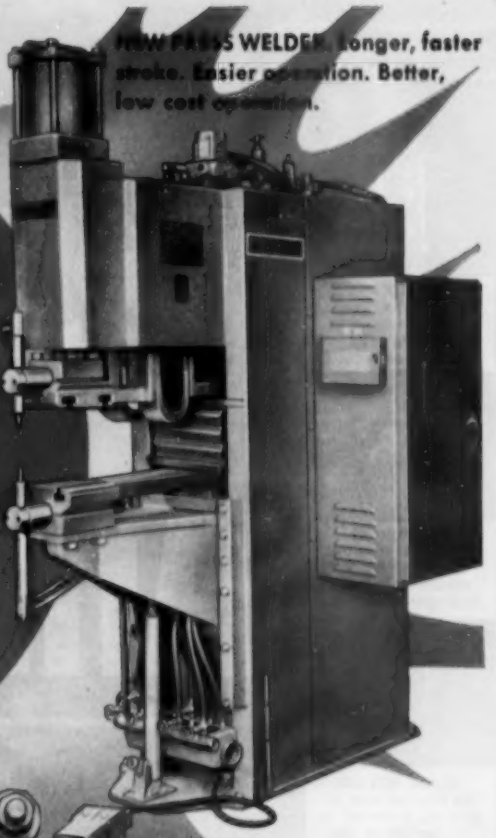
Flash welding is a resistance welding process wherein coalescence is produced simultaneously over the entire area of abutting surfaces. This is done by heat obtained from resistance to electric current flow between the two surfaces, and by application of pressure after heating is substantially completed. Flashing and upsetting are accomplished by expulsion of metal from the joint.

A midwest company fabricates 40-ft sections of pipe by flash welding the entire length in one 35-second operation. Flash welding is used extensively in automobile body fabrication, and the process is now being used to fabricate crank shafts.

As American industry stands on the brink of a new production revolution—that of automation—welding will play a key role. Only welding can join metal parts in the continuous, high-speed manner that successful automation procedures demand.

Equipment that can make 30,000 welds an hour is already in use in the automotive industry, and the end is not yet in sight.

what's new IN RESISTANCE WELDING?



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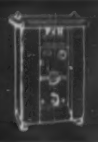

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Better welds — fewer rejects — Starting and recovery are instantaneous (without use of steel wool, high potential pilot circuits, etc.) Moreover, you get instant recovery when tack welds, areas of poor fit-up, etc., are encountered. There is no appreciable change in arc voltage. The "hunting" of conventional voltage-regulated feed-rate-control devices is eliminated. You get steadier, more uniform welding — with fewer rejects.

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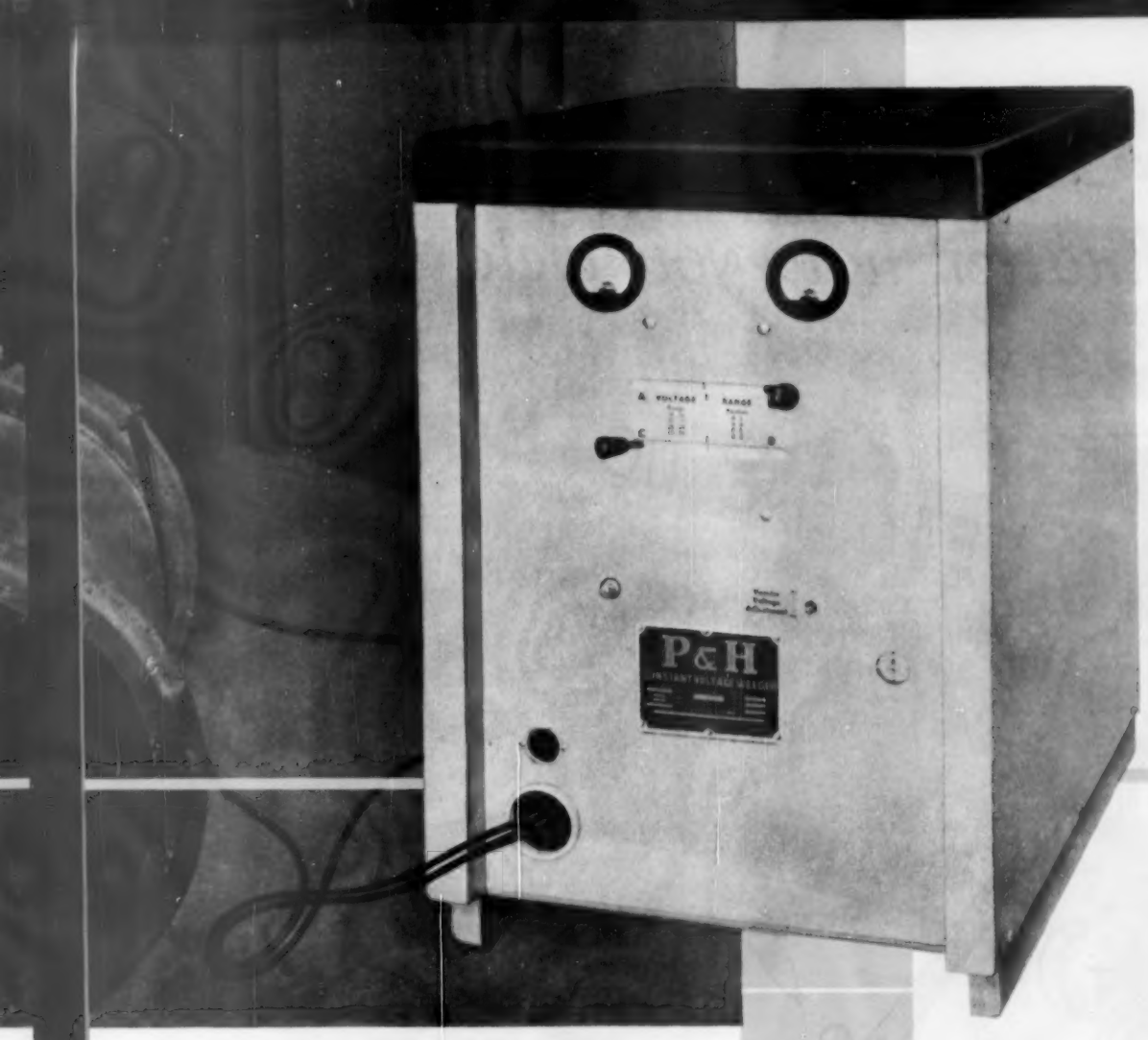

Welders

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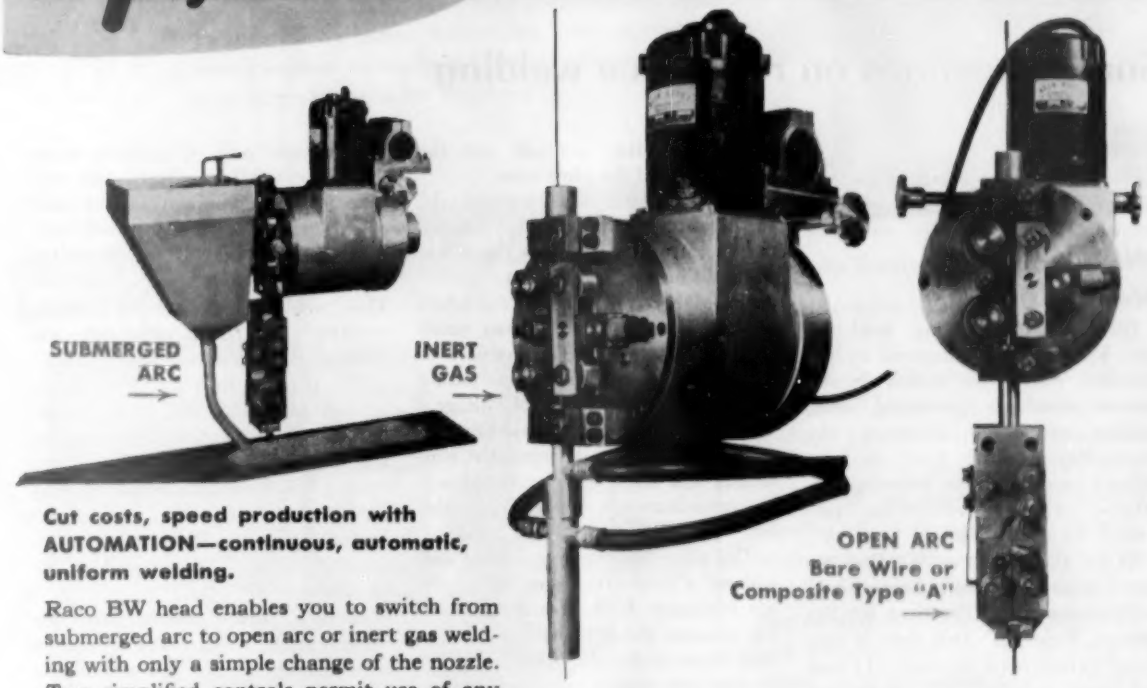

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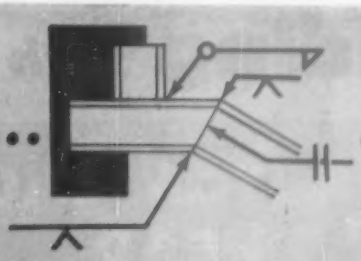

the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Some questions on resistance welding

Question:

We know of the many codes and standards for arc and gas welding, but what about rules for resistance welding?

Answer:

The resistance-welding field, to date, has not been hampered by the excessive restrictions found in numerous standards governing other welding processes. However, the Army, Navy and Air Force do have military specifications covering resistance welding operations performed by contractors.

As for the American Welding Society . . . so far, it has published only its "Recommended Practices for Resistance Welding." This data is presented in four main sections: (1) spot and seam welding; (2) projection welding; (3) flash-butt welding, and (4) standard methods for testing the welds.

* * *

Question:

What are the functions of the ignitron and thyratron tubes used in resistance-welding controls?

Answer:

The ignitron is a mercury-vapor tube capable of handling large amounts of power. This heavy-duty tube, basic to resistance-welding control, is a high-capacity rectifier of alternating currents. In most electronic welding controls, a pair of ignitron tubes is used in the transformer primary circuit as an inert, noiseless, single-pole switch.

This ignitron must be controlled, and that is the function of the thyratron. The latter serves as a firing tube for the ignitor circuit of the former.

Two other lesser known tubes in resistance-welding controls are the phanotron and the glow tube.

The phanotron is a hot-cathode, gas-filled tube without a grid (unlike the thyratron, which sometimes has an additional shield grid to permit use of higher resistance for the tube's control). In resistance welding, small phanotrons are used as rectifiers to provide d-c power for various timing circuits and for d-c control voltage.

Larger phanotrons are used to convert a-c to d-c for d-c operated contactors and solenoids and for charging capacitors in stored-energy welding.

The glow-tube—also gas-filled and without a grid—functions as a voltage regulator. In the resistance-welding process, these tubes are used to hold constant the d-c voltages needed in electronic timing circuits to assure accuracy.

Every electronic tube has four basic parts:

(1) A surface which gives off electrons (cathode);

(2) A surface which receives electrons (anode);

(3) A glass or metal envelope;

(4) Terminals for connecting the tube into the circuit.

* * *

Question:

Can you list some of the more important advantages and disadvantages of the ignitron timer?

Answer:

The ignitron timer has adjustable timing and interrupting rates that are particularly desirable in seam welding. In addition, the ignitron timer allows greater flexibility in that welding current magnitude may be readily varied by means of a heat control adjuster.

The same pair of ignitron tubes that vary welding current also will time its flow. The ignition of each power tube is delayed for each half-cycle of welding current desired to reduce the heating value of current. Thus, welding heat or current can be accurately controlled without the use of taps on the welding transformer.

The ignitron tube contactor is not subject to mechanical wear or arc burning. When controlled by mechanical or electrically-timed relays, however, it has the disadvantage of being unable to close or "fire" at the exact instant on the voltage wave corresponding to zero current (power factor angle of the load.)

If tube "firing" agrees with the natural angle of the load, a minimum of transient currents in the line may be expected. The ignitron can never fire at zero voltage, but must wait to obtain sufficient forward voltage to ionize or "fire."

Even with this inherent fault, however, it does offer an improvement over the other contactors.

* * *

Question:

Why will spot welds on waved or buckled sheets so often fail at the point of welding?

Answer:

Failure of spot welds in wavy sheets is usually the result of insufficient pressure. There are three prerequisites for a good weld: current, pressure and time. These variables must be adjusted or arranged to suit each other in any given application.

Weld points separated through lack of pressure will never receive sufficient melting heat, and will therefore never fuse.

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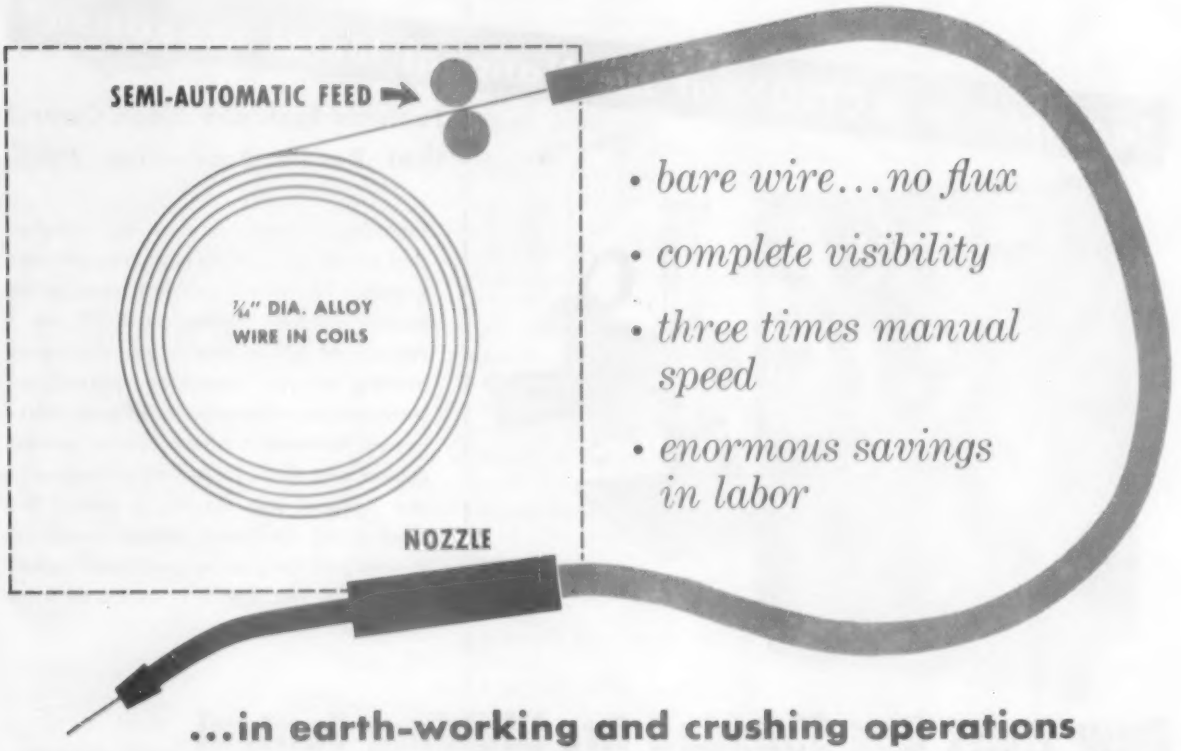

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This is a totally new hard-facing method utilizing the welding speed of the semi-automatic machine to produce sound deposits of wear-resistant alloys. The wires run bare, using no flux, so that the weldor enjoys full visibility at all times...deposition rates at normal welding currents (200 to 300 amps) are double or triple those of the manual method...standard semi-automatic equipment is easily converted to handle Stoody wires.

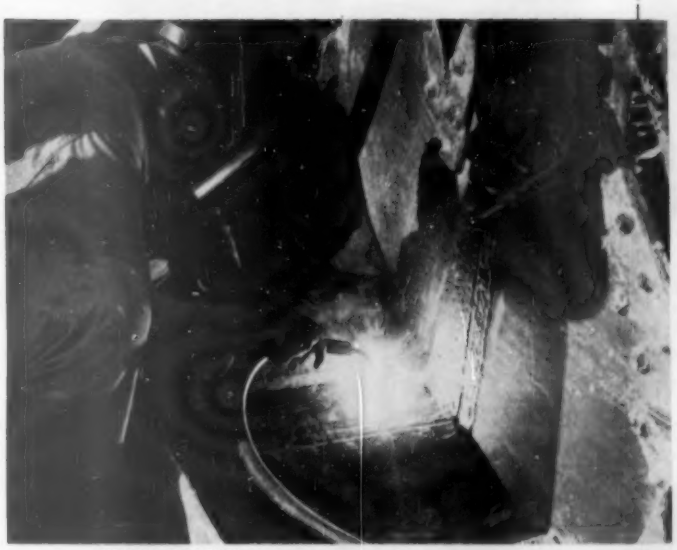
Maintenance time and welding costs are reduced through increased service life provided by Stoody alloys and the greatly increased welding speed. Weldors like the semi-automatic, find it easy to operate with less fatigue.

Your Stoody dealer (check the "yellow pages" of your phone book) will be glad to give you full information, plus a demonstration on your own equipment without obligation. Or write to the company for literature and the name of your nearest dealer.

STOODY COMPANY

HARD-FACING

Stoody Wires



SHOVEL BUCKETS: TEETH, LIPS, ADAPTERS, ETC., *Stoody 121 gives good wear resistance, quickly covers wearing areas on this clamshell and other types of buckets.*

Stoody 100...a high chromium alloy wire for equipment subject to severe abrasion and impact. This is similar to Coated Tube Stoodite. Used on crushers, buckets, rippers, augers, tool joints. Deposits 10 to 18 pounds per hour.

Stoody 121...a medium alloy material with excellent resistance to abrasion and impact. This is similar to Stoody 21. For bucket teeth, shovels, grizzlies, loader lips, crushers. Deposits 9 to 16 pounds per hour.

Stoody Nickel Manganese...produces a Hadfield manganese deposit for build-up of all manganese parts—crushers, buckets, shovels, teeth—preparatory to hard-facing. Deposits 4 to 7 pounds per hour.

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ALL TYPES OF CRUSHERS: *Ideal applications for Stoody 100 because of excellent wear resistance and impact strength. Semi-automatic application greatly speeds welding.*

BULLDOZER END BITS: *Can be hard-faced in one third of time required by manual process. Stoody 121 is recommended.*

SCRAPER BLADES: *Parallel beads of Stoody 121 are fast and easy to apply to scraper blades, add excellent wear resistance.*

SHOVEL TRACK PADS: *Use of Stoody Manganese applied by semi-automatic welder cuts time on maintenance.*

NO SINGLE

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MILLER SR RECTIFIER TYPE DC ARC WELDERS

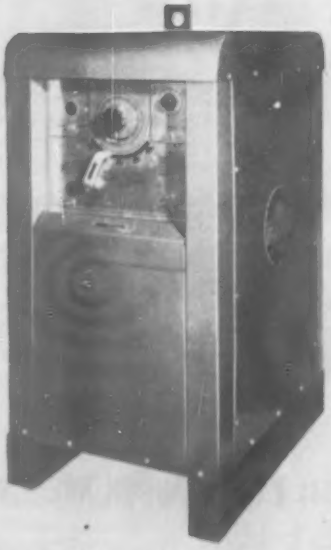
Available in 200, 300, 400 and 600 amperes, it is a superior direct current welder using Miller Unitran transformer control and selenium rectifiers for conversion from 3 phase AC line current. Miller SR Welders feature widest possible current range, extreme arc flexibility, maximum electrode deposition rate and highest electrical efficiency.

THE *New* MILLER SRH RECTIFIER TYPE DC ARC WELDER

A new concept in welder design for all DC metalic arc welding. Available in 200, 300 and 400 amperes. It is ruggedly constructed, compact, and is designed to lend itself to stacking for parallel operation or to conserve floor space. It has single range control and is weatherproof.

MILLER ARC WELDERS FOR TUNGSTEN ARC WELDING PROCESS

These Miller Welders feature the patented Miller UNITRAN control circuit which combines the transformer with its own integral flux diverter. This, in conjunction with adequate open circuit voltage, high frequency, balancing resistor and optional controls insures superior uniformity and flexibility throughout the entire welding range. Available in nine models.



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Available in 14 models, this new Miller Welder provides both AC and DC welding power for applications where both are required. It operates from a single phase power line and is available with high frequency and controls designed especially for inert gas arc and spot welding.

MILLER 100 SERIES HEAVY DUTY INDUSTRIAL TYPE AC WELDERS

Designed for heavy production welding and automatic welding applications. Available in eight models. The 100 Series Welders permit faster welding — as much as 35% faster. Movable coil design and 80 volts O.C.V. produces uniform and better welding characteristics throughout the entire range of the welder.

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AC and DC ARC WELDERS

Select from the Complete MID-STATES Line

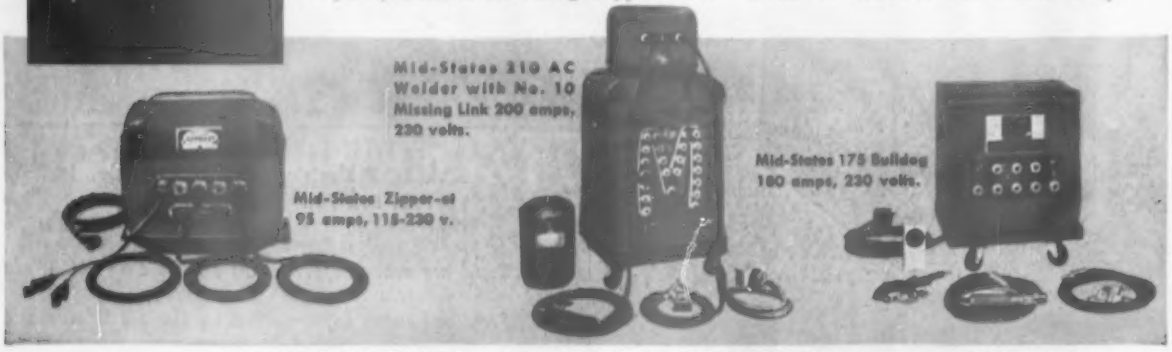
Something new and big has been added to the Mid-States Welder line: the New Mid-States Viking AC and DC industrial-duty arc welders . . . proved in performance and recognized for their fine quality.

Mid-States Viking Welders are available in three types to suit every industrial welding purpose:

AC transformer type of 200, 300, 400 and 500 amps rated capacity; DC rectifier type of 200, 300 and 400 amps rated capacity; and the AC inert gas type of 200 and 300 amps rated capacity. The Mid-States Vikings have patented features, unique design and a sturdy construction.

And in the well known Mid-States Welder group of lower amperage units there are sizes ideal for shop use—ranging from 7 to 300 amps capacity.

Whatever your arc welding problems may be, light or heavy duty, general or production work, there is a Mid-States to do the job the way you want it done. Write for literature and details today!


Mid-States 210 AC Welder with No. 10 Missing Link 200 amps, 230 volts.
Mid-States Zipper-el 95 amps, 115-230 v.
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Mid-States WELDER MFG. CO.

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a truly all-purpose all-position electrode for welding mild steel

THE NEW NCG SUREWELD® "CE" ELECTRODE

NCG's new "CE" Electrode is designed to perform with maximum efficiency over a wider range of applications. It is usable in all positions with AC or DC straight or reverse polarity. Operators like this new rod because it is easy to strike and hold an arc, even with AC at low welding currents and low open-circuit voltages. There is little spatter; the arc is soft; action is quieter, with spray type metal transfer. Beads are smoother, with a fine, even ripple—free from pock-marks and slag inclusions. Slag deposits brush off easily. "CE" deposits with remarkable efficiency in any position. *Sureweld* "CE" conforms in all respects to E-6013 specifications. Your NCG dealer or nearest NCG office will be glad to demonstrate this new rod and let you try it for yourself. Contact him today.

Here are reports from the field:

"The best all-around AC rod I've ever used."

"We are getting very good results with CE. And we like the way the slag practically drops off when cool."

"Beads have exceptionally smooth surface."

"In our book it surpasses any other E-6013 on the market."

"We think it's superior to all other 6013 electrodes in running characteristics."

"We find we can use it on more jobs than any other electrode we've tried."

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EVERYTHING FOR WELDING

GENERAL MOTORS PRESENTS:

"Powerama"

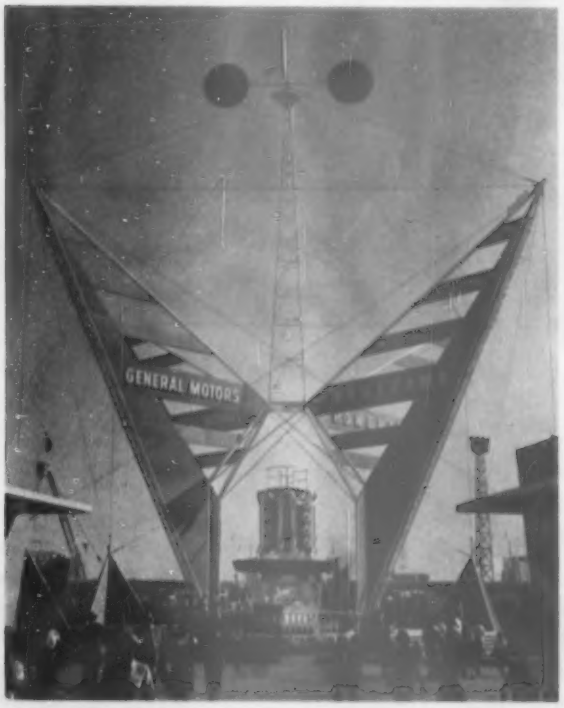
"LITERALLY millions" is a phrase that serves far better than any string of numbers to describe the human sea that enveloped and applauded the General Motors Corp.'s "Powerama" display just concluded on Chicago's lakefront.

Visitors came from the Windy City, the Midwest, and all points in the United States to witness this spectacular presentation of modern industry's techniques and products. Powerama ended a 26-day stay on September 25.

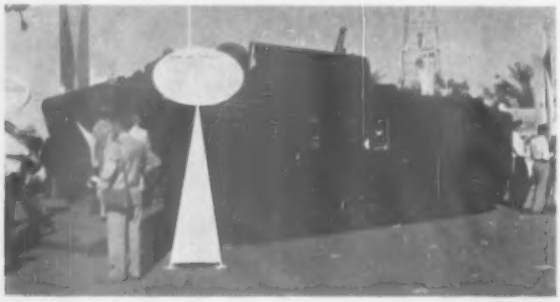
There was something for everyone to see: modern trains and farm equipment; planes, tanks and a submarine; kitchen appliances and streamlined, experimental automobiles. And for those with an eye on welded fabrications, Powerama proved itself a goldmine.

Practically every piece of equipment on display showed some evidence of welded construction. Even the signs and framework around every exhibit had been shop fabricated by welding and erected on the display site.

The pictures on this page tell the story of Powerama's "bigness" and appeal far better than any words could. We hope you'll enjoy this vicarious "trip" to a truly great industrial display.



WELDED centerpiece dominated Powerama site and reflected the theme of modern design displayed in exhibits surrounding it.



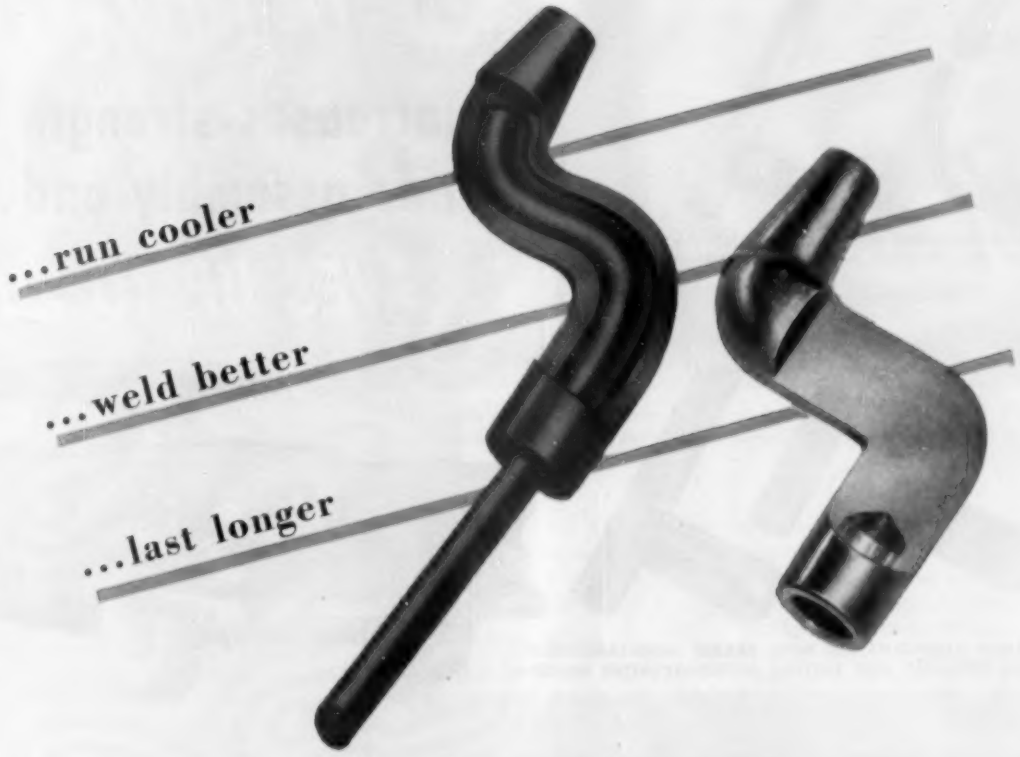
PERSONNEL carrier, tracked and capable of amphibious operations, was largely welded and proved a great attraction for visitors.

REVOLVING platform displayed scale models of earth moving, farm and other heavy equipment types. Structure was fabricated by welding.

EVEN the pig in this mock barnyard set-up is welded! Displays of new and modified farm equipment played an important role.

THREE welded exhibits can be seen in this "Powerama panorama": new "Aerotrain" in background; earth-moving equipment at left, and twin-Diesel tractor at right.

MALLORY Cold-formed Electrodes



By means of special cold forming techniques, Mallory produces single-bend, double-bend and irregular shaped electrodes which have properties superior to those obtainable by conventional casting or hot forging.

They run cooler—because the cooling water tube goes closer to the tip. The tube can be bent in place*, and thus follows the shape of the electrode. The exclusive Mallory fluted cooling hole, which provides increased cooling area, can also be provided in these irregular electrode shapes.

They weld better—because cold forming develops strength and hardness considerably higher than that of cast or forged metals.

They last longer—because the combination of cooler operation and higher strength add up to longer runs between dressing . . . lower cost per weld.

Scores of "special" shapes can be produced promptly and at economical cost from Mallory's standard tools. You will probably find the exact style your application needs, in the Mallory series. For technical data, or for a consultation on your welding problems, call your local Mallory Welding Distributor . . . or write to Mallory today.

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MALLORY
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SAVES UP TO 20%

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The successful combination of Ford Engineering and Silvaloy Brazing Alloy multiplies production efficiency for this Ford Transmission Gearshift Tube and Socket assembly—*with important savings in costs!* Formerly, single assemblies were butt-welded, the flash removed and joint buffed. Now, four assemblies are brazed simultaneously—without need for grinding or buffing after brazing. A Silvaloy Technician will be glad to assist in planning brazing production in your plant, to help you cut costs, improve results and speed production. Call or write today. There's no cost or obligation, of course. ★ ★ ★ ★ ★ ★ ★

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Another "first"

All-welded steel dock

STEEL deck on top side of one dock unit is being welded in place. Watertight compartments cross-hatch the open underside of the dock and float it into position

DELIVERED recently to the Astoria, L. I., generating station of Consolidated Edison Co. of New York, Inc., was an all-welded steel dock—claimed to be the only one of its kind in the United States.

Built by Pusey and Jones Corp., Wilmington, Del., the dock will be used to support an unloading tower capable of handling 14 tons of coal per minute from vessels moored to the dock.

Built in two units on side-launching ways, the dock has an overall length of 467 ft. and weighs 1,300 tons. Two watertight compartments extend the length of the dock, and between them smaller compartments, 10 ft. wide, are spaced at 40-ft intervals. A steel deck covers these compartments on the top side of the dock only.

Watertight wells spaced 40 ft apart along the sides of both units hold 24 steel cylinders. These cylinders, 6 ft in diameter, serve as stilts on which the dock is raised to a proper height after positioning.

Designers and prime contractors of the dock, DeLong Corp., New York City, raised the dock to its operating height with the aid of powerful air jacks on each cylinder.

Submerged-Arc Welds

The cylinders were rolled from 1,400 ft of 6-ft-wide steel, and welded with automatic submerged-arc units. Power turning rolls were used on circumferential seams, and a movable ram on longitudinal seams.

Three areas of fabrication and assembly were set up adjacent to the launching ways. Here, large sections of the dock were welded with portable submerged-arc equipment powered either by a-c welding transformers or by rectifier welders. The majority of welds were made in the downhand position, using large-diameter E6020 electrodes.

Identical welding procedures were used throughout fabrication of both dock units, except on out-of-position welds. Here, motor-generator type welders were used with E6010 electrodes.

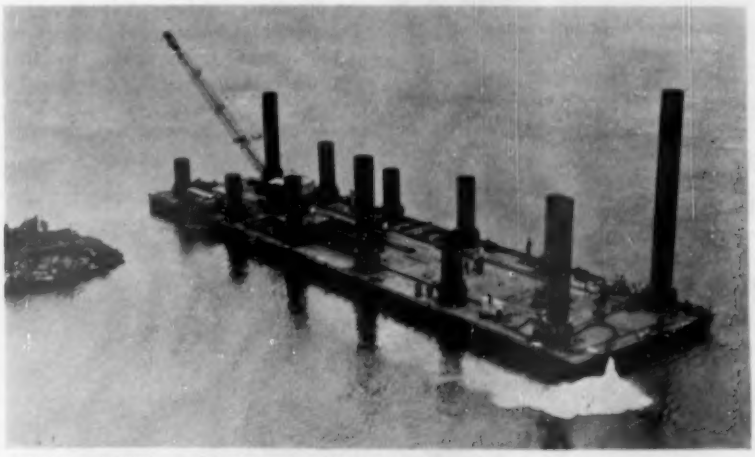
Distortion Prevented

All welding adhered to a planned schedule, with transverse welds being made in a proper sequence with longitudinal welds. As each section was completed, it was immediately welded to the adjoining completed section. This procedure successfully kept all components in good alignment.

The side-launching of the dock units presented a problem in stresses, because of the open or "waffle-bottom" construction. Additional sliding ways placed under the docks at all cross sections, however, gave an adequate support and bearing during the launching.

The dock was towed down Delaware Bay and up the coast to New York harbor. Shortly after it left the ways, construction of a similar prefabricated welded steel dock was begun—adequate tribute to a successful experiment.

While this installation was essentially a patented, specialized engineering achievement, Pusey and Jones have expressed the belief that welded steel prefabrications — and this particular method of installation —will have industrywide significance.



FOLLOWING launching, steel cylinders are brought aboard dock unit by crane and seated in watertight wells. After positioning, dock is jacked up on cylinders to proper operating height

INSPECTORS Harry DeFrees (left) and Walter Falkenburg with radioactive "cameras" between them.

COLUMN towers over 41-story Prudential Building. Base for antenna and tower is on roof of 39th floor.

New high point on Chicago's skyline

Radiographic quality in TV tower welds

By a Staff Member

CHICAGO's newest skyscraper—the Prudential Building—looms 601 ft above ground level, making it the Windy City's tallest by some 44 ft.

But extending even beyond this point is a television tower and antenna that establishes a new high point on the Chicago skyline—915 ft.

DERRICK swings another section into position. When making circumferential welds to join sections, weldors worked on scaffold with side curtains.

This extension, said to be the city's first all-welded tower, has just been completed.

Located on Randolph St., east of Michigan Ave. and near the lakefront, this modern building, more formally known as the "Mid-America Home Office of the Prudential Insurance Co. of America," is scheduled to be dedicated early in December. Prudential occupies approximately 8½ floors, with the remaining space leased to leading industrial, advertising and professional organizations.

Although 41 stories high, it is the structure's 39th-story roof that serves as base for the television antenna built for WGN-TV, the Chicago *Tribune* station.

The station's 50,000-watt transmitter is located on the 40th floor.

Welds Were Radiographed

Shop and field welds used to join the tower's components were radiographed to insure their soundness.

Atop the roof of the 39th floor, a circular base of steel, 2 in. thick and weighing 20 tons, serves as foundation for the tall tower. This base, in turn, is connected to the lateral beams of the building by means of high-tensile bolts. These lateral beams are joined by rivets to vertical columns.

Although primarily of riveted construction, the Prudential Building's continuous horizontal fluted aluminum spandrels are arc welded to the steel columns.

The tower itself extends 311 ft above the 39th floor; atop this tower is an antenna pole about 75 ft in height. This pole, made of heavy-duty pipe 12 in. in diameter, was brought to the top of the building in four sections.

Tower Tapers Skyward

After the sections were joined and the necessary equipment (like cables, TV signal radiators and a warning light) installed, the pole (by this time an 8,500-lb assembly) was raised

WELDOR tacks steel plate which serves as protection for large bolts at base of TV antenna tower.

to the top of the mast and welded in place.

The huge, pipe-like sections of the tower range in wall thickness from 1⅜ in. at the base to ⅝ in. at the summit. To reach the 311-ft level, 23 sections were used. These vary in diameter from 10 ft (at the bottom) to 3½ ft (at the top).

Lower sections were put into position by means of a regular derrick, working from the 41st floor. Upper sections were positioned through use of a modified "gin-pole" rig.

Field welding of sections was accomplished using E7016 (low-hydrogen) electrodes. Four weldors constituted the welding labor force atop the building.

Shop welding of the various sections was done by the automatic submerged-arc process, with some manual welding where the automatic method could not be properly applied.

All welding and radiographic examination of the tower was done in accordance with the ASME code for unfired pressure vessels.

Because of the location of the work, field welding took a little more time than it ordinarily might. Imagine yourself sitting on a small scaffold, more than 700 ft above the ground, welding in the horizontal position!

Cobalt and Iridium

Welds were radiographed by means of radioactive cobalt and iridium-192 by an inspector from Pittsburgh Testing Laboratory, Pittsburgh. Two "cameras" were used to "shoot" the welds.

Upon completion of a weld, a strip of photographic film was attached to the new joint and the cobalt or iridium camera aimed at it from inside the tower.

Cobalt was used to radiograph the thicker sections of the tower's base. Here a four-hour exposure was required, but on the thinner sections, the iridium emitted gamma rays that were able to penetrate 1⅛-in. steel in about 10 minutes.

Approximately 20% of the linear footage of a weld had to be radiographed to meet specifications.

Building architects were Naess & Murphy, Chicago. The American Bridge Division, U. S. Steel Corp., erected the structural steel members of both the building and TV tower. Alliance Engineering and Construction Co., Chicago, used a gin-pole rig to place the antenna atop the mast.

The amazing **VERSATILITY** of **EASY-FLO** and **SIL-FOS**

You'd have to go a long way to find a brazing job that these low-temperature silver brazing alloys can't do.

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Between them, the EASY-FLO and SIL-FOS alloys will join practically all ferrous, non-ferrous and dissimilar metals and alloys that have melting points above the alloys' respective flow points.

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The EASY-FLO and SIL-FOS alloys work well with all . . . oxyacetylene, natural and city gas torches – gas-air burners – oil, gas and electric furnaces – electric induction, resistance or incandescent carbon – molten alloy or salt dip . . . take your pick.

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EASY-FLO and SIL-FOS naturally and consistently make joints that . . . go up to 130,000 psi in tension and 48,000 psi in shear . . . have the ductility to take any stresses and strains the metals they join can stand . . . are liquid and gas-tight . . . have high electrical and heat conductivity . . . offer strong resistance to many corrosive agents.

In the job shown here induction heating is used to braze steel handle bars to stems with EASY-FLO 35 – 6 at a time in 32 secs. The two jobs shown at left above are gas torch brazed with EASY-FLO 45.

ADD to their 3-ply versatility the fact that their low flow points protect metals and save gobs of time, labor and heat – and you have every reason to standardize on the EASY-FLO and SIL-FOS alloys for all your brazing.

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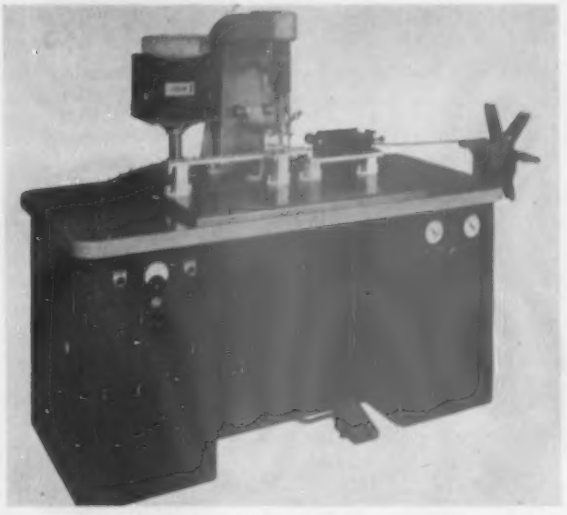
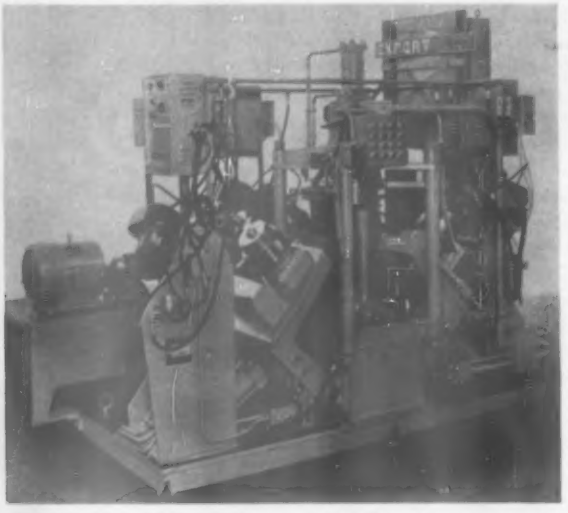


AUTOMATIC stud welding machine can weld studs to strip stock at rate of 80 per minute.



MACHINE consists of three welding heads and a vertical hydraulic assembly press.

Stud welder

AUTOMATIC stud welding machine, "model X-8000," is designed for production welding. This unit is fixtured for welding studs to strip stock fed continuously from a coil. Stud feed to the gun is automatic.

Studs can be welded at the rate of 80 per minute while power consumption averages 1½ kva, states the manufacturer.

Unit can be furnished with a revolving index table for welding of individual parts or assemblies. A pedal is supplied to permit single stroke operation. *Graham Mfg. Corp.*

Circle No. 1.

* * *

Toggle clamp

MODEL "P-5" toggle clamp is said to have a 10,000-lb. horizontal clamping pressure. It is of all-welded construction with a heavy steel frame. This "Caddy" clamp has a 2 15/16-in. stroke with all-bronze plunger, said to resist welding spatter. *Erico Products, Inc.*

Circle No. 2.

* * *

Welding head

WELDING head, "WHD 5", is said to permit spot welding of subminiature parts down to 0.0003-in. thicknesses. Unit has a rigid welding arm with a moving mass of less than ¾ oz mounted in radial ball bearings. The arm is self-balanced. The only pressure on the electrode is that exerted by a leaf spring.

The welding head can be used with any small welding power supply with suitable timer, or with special stored energy power plants. *Ewald Instruments.*

Circle No. 3.

* * *

Hardfacing rod

"MULTI-pass" hardfacing rod is designed for build-up purposes. It is a medium carbon, low-alloy rod said to make a tough and ductile deposit, and can be built up layer on layer without spalling or cracking. This rod can be used with either a-c or d-c. *Victor Equipment Co.*

Circle No. 4.

* * *

Welder

ENGINE-driven, 200-amp welder is for pipeline welding, construction work, maintenance and repair. It consists of a specially designed welding generator coupled with a liquid-cooled engine operating at 1,750 rpm. The generator and power unit are assembled on a common welded base and housed in a sturdy frame. A full-length canopy protects operating parts.

Welder has a 40-250 amp range, easy, accurate current control, minimum load dropoff, and good arc characteristics with high, instantaneous recovery voltage, preventing popouts, claims the manufacturer. It has a skid-type base with lifting and towing eyes; can fit cross-wise in standard half-ton pickup truck. *General Electric Co.*

Circle No. 5.

Automatic welder

AUTOMATIC welding machine combines assembly and argon-shielded, arc-welding operation. One operator can assemble and weld two 8-in. diameter sheet metal fluid coupling parts at a rate of 300 finished assemblies per hour, states manufacturer.

Termed the "Expert Triaxial Welder," the machine consists of a vertical hydraulic assembly press and three standard argon-shielded, arc-welding heads. The heads are positioned at 90-deg locations. A hydraulic power pack supplies power for all control and operating functions. The welder occupies floor space of 5 by 10 ft. It is 7 ft high. *Expert Welding Machine Co.*

Circle No. 6.

* * *

Induction heater

NEW 30-kw induction heater is a "building block" unit that has all elements needed for induction heating. It is said to be ideal for hardening and heat treating, metal joining, hot heading and forging.

The unit comes totally enclosed, water-cooled, or open air-cooled. Coils for specific applications can be added. There are three parts: the 30 kw, 10,000 cycle water-cooled m-g set with generator control; high frequency output cabinets, and a work table. These can be combined and adapted for various applications. *Westinghouse Electric Corp.*

Circle No. 7.

NEW K·G "on guard" REGULATORS

are protected against rough handling

K-G "On Guard" Regulators are tough. They can "take it" and stay on the job, instead of the shelf. They provide improved economy, safety and performance, practically eliminating regulator repairs—internal and external.

Long Life — Less Repairs — Less Cost!

Features *Exclusive* with K-G:

1. Patented *gauge guard*, with positive spring lock action.
2. Stainless steel inlet nipple strong enough to endure impact resulting from accidental cylinder upset.
3. Stainless steel internal adjusting screw of an exclusive, completely new and rugged design.
4. Smooth, easy pressure adjustment developed by a fully enclosed thrust-bearing—part of the adjusting mechanism.
5. Strong stainless steel in all internal parts.
6. Body and bonnet forgings of a new aluminum alloy of great strength and corrosion resistance.
7. A *new* sintered stainless steel Filter Pressure Check Unit, precludes the basic causes of regulator failure, exclusive with K-G.

K-G Gauge Guard Regulators are available in both single and two-stage models for most compressed gases. Send for new bulletin giving detailed information.

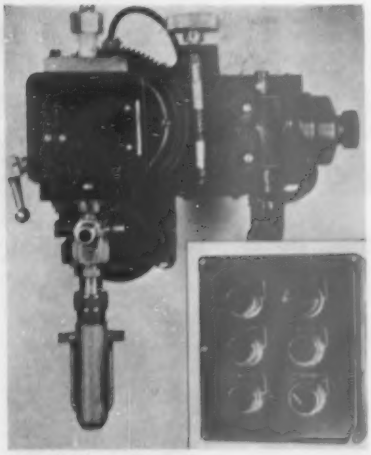
K·G

UL

The K-G Equipment Company (Inc.)

A Unit of Air Products, Inc.

Dept. A, Box 538, Allentown, Pa.



Welding head

AUTOMATIC welding head is for Mig (metal inert-gas) welding applications. Argon, carbon dioxide and helium gases and all kinds of welding wires from 0.030-in. diameter and up, can be used, it is claimed.

Head has single motor drive. Compact in design, unit has continuous current rating of 600 amp. *Air Reduction Sales Co.*

Circle No. 8.

* * *

Center-fixer

NEW center-fixer is designed for keeping a center-point. This device makes possible circular operations without having to worry about the center-point.

After determination of the center, the finder is attached by a permanent magnet. The magnet is temperature-proof up to 400 C. *Tradeware Corp.*

Circle No. 9.

* * *

Flux

NONACID, soldering flux is for use with 40-60, 50-50, 60-40 and 95-5 solders. When heated, the flux flows by capillary action through surface oil film, dispersing any metal oxides.

Attraction of the solder for metal forces flux from the metal, leaving no residue. No wire brushing or sanding is needed, states manufacturer. Flux is available in 2-oz can. *Lake Chemical Co.*

Circle No. 10.

Midget positioner

MIDGET work positioner is for smallest type of assembly and inspection work. It is 2 in. high and weighs ½ lb. It can support 5 lb of work weight at a distance of 3 in. from the swivel center, it is claimed. *Wilton Tool Mfg. Co., Inc.*

Circle No. 11.

* * *

Grinding wheel

THIS high-density, heavy-duty grinding wheel is designed for cleaning stainless steel slabs or billets. The wheel is said to last longer and clean faster than conventional models. Used in swing frame snagging, wheel is manufactured in sizes from 16 to 24 in. in diameter and from 1½ to 3 in. thick. *Electro Refractories & Abrasives Corp.*

Circle No. 12.

* * *

Eyeshield

LIGHTWEIGHT "Secureye" eye shield gives 180-deg vision range. Rigid and tough construction affords full eye protection against flying particles. It is said to provide a larger protective area than usually given by ordinary goggles.

Shield fits around eyes, nose-bridge, upper face and temples. There are no seams or joints. Shield is made of transparent clear or green non-shattering "lumarith" plastic. An opaque green visor eliminates overhead glare. Shield has soft foam rubber sweatbands and elastic headband. *Pulmosan Safety Equipment Corp.*

Circle No. 13.

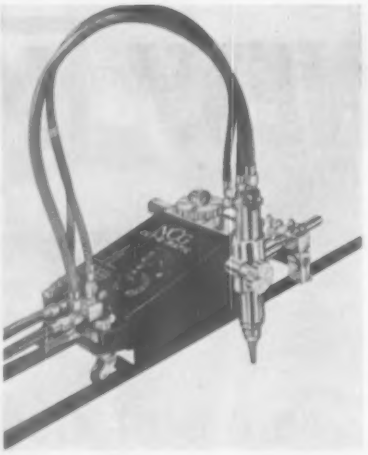
* * *

All-purpose welder

SINGLE phase, a-c/d-c welder is for light fabrication welding. Termed the "RMC-4J", the welder affords a continuous current range, full overload protection, and a high degree of portability, states the manufacturer.

Unit is fan-cooled and operates from a 230-volt power supply. It is 36 in. high, 19⅝ in. wide and 12 in. deep, and weighs 200 lb. An accessory package is available separately. *Westinghouse Electric Corp.*

Circle No. 14.



Flame-cutter

PORTABLE flame-cutting machine is said to have greater cutting accuracy. This improved "Cut-O-Matic Model No. 7" weighs 30 lb, including torch. Lightweight design makes unit easier to use and to carry from job to job.

The three-point suspension system insures four-wheel rolling contact with the plate, minimizes machine side-tilt and wobble, states the manufacturer. A valve block permits preheat adjustments. Unit is available with either 110-115 volt, a-c/d-c or 220 volt a-c motor, standard or slow speed. *National Cylinder Gas Co.*

Circle No. 15.

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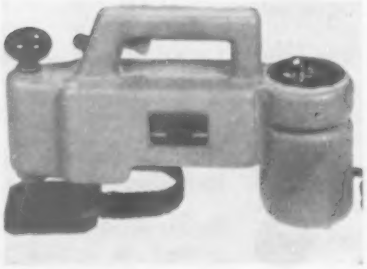


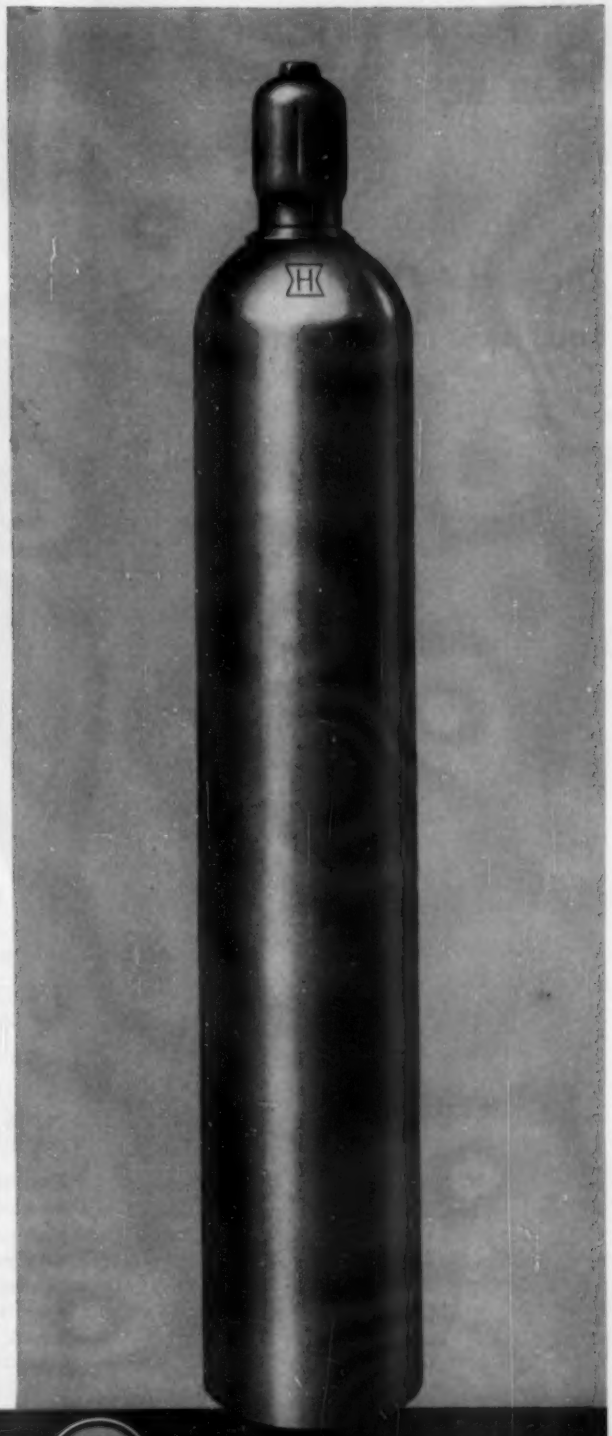
Band welder

"THOMAS" band welder joins face wire and retainer bands on cylindrical filter screens, washers and deckers. The tool welds the face wire seam and also spot welds the two band ends together. An automatic cycle control is said to assure uniform welds while eliminating danger of overheating the band.

Joining is done in less than 60 seconds per band, states the manufacturer. Old bands can be re-used by adding another short piece and welding together. Welder mechanism is enclosed by shatter-proof, fiber glass case. The unit weighs 25 lb and operates on a 110-volt, 60-cycle outlet. *Thomas & Middleton Equipment Designers.*

Circle No. 16.

Every HARRISBURG GAS CYLINDER has unusual life expectancy



Buyers of gas cylinders generally consider two qualities especially important—lightness and durability. Harrisburg Cylinders are designed to obtain an optimum balance between these two advantages.

All Harrisburg Seamless Steel High Pressure Gas Cylinders are made as light *as is consistent with long life expectancy*. When you order Harrisburg Cylinders you can be sure that you are getting something far better than cylinders that just barely meet the specifications—we make them with an eye to passing future quinquennial tests.

If you want your money's worth, buy cylinders with a future—

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YOUR BEST ELECTRODE

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The ONLY All-Position Iron Powder Low Hydrogen Electrode

7016

8016N
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8016CM
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9016CM
(2¼% Cr., 1% Mo.)

10016MM
(1.70% Mn., .40% Mo.)

- X-ray quality weld metal
- No starting porosity
- More pounds of weld metal per electrode used
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Alloy Rods Co.

General Offices and Plant • York 2, Penna.
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El Segundo, Calif.

no finer electrodes made... anywhere

C-P welder

WELDER, available in 500, 750 and 1,200 amp, allows operator to select the arc voltage. The voltage remains constant during the welding cycle. This constant-voltage feature is said to insure uniform deposits, making welding operations more efficient and producing fewer rejects. The unit (manufactured by Glenn Co.) can be used in a variety of automatic and semiautomatic welding processes. *Harnischfeger Corp.*

Circle No. 17.

* * *

Tig torch

TRANSPARENT gas cup on "Visuweld" torch for Tig (tungsten inert-gas) welding lets you watch the weld at all times.

Work range is up to 300 amp. Overall length of the torch is 7½ in., working height is 2 in. Torch comes equipped with 12½ ft of hose. Available in chuck sizes of 0.040, 1/16, 3/32 and ⅛ in. *Tec Welding Co.*

Circle No. 18.

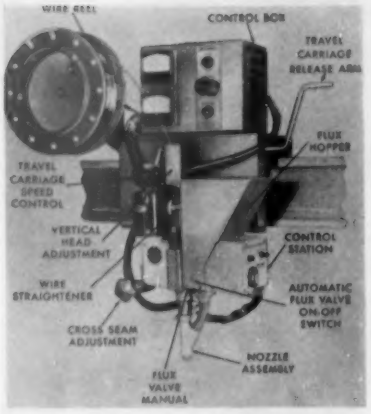
* * *

Welding ring

DEVELOPED to improve submerged-arc welding of pipe and fittings, a new flat type welding ring with ⅜-in. diameter spacer pins is also suitable for many manual welding applications. Manufacturer claims it enables joints to consistently pass X-ray and gamma-ray inspection.

Small spacer pins automatically center the ring in the joint and prevent it from shifting up or down stream, even in vertical or steeply sloping lines. After pipe ends are properly tacked, the spacer pins, which project beyond the pipe's outside diameter, are knocked off with a sharp blow of the chipping hammer. *Tube Turns.*

Circle No. 19.



Automatic welders

COMPLETE new line of submerged-arc equipment includes three new welding heads, new controls and adjustments, accessories and two power sources.

Heads—"LAF-3, LAF-4, LAF-5"—offer choice of a-c or d-c, field or shop welding and constant-potential or variable-voltage power source. They can be universally positioned in any angle in three dimensions or off center for round-about welding and can be positioned on seam while welding.

Mounting equipment is available to give either a stationary mounting, one on a self-propelled travel carriage, or one on a self-propelled tractor. Heads can be adapted for tandem welding or for an oscillating attachment.

The two new power sources are the "Lincolnweld AC-750" and "DC-750," both rated at 750 amp. *The Lincoln Electric Co.*

Circle No. 20.

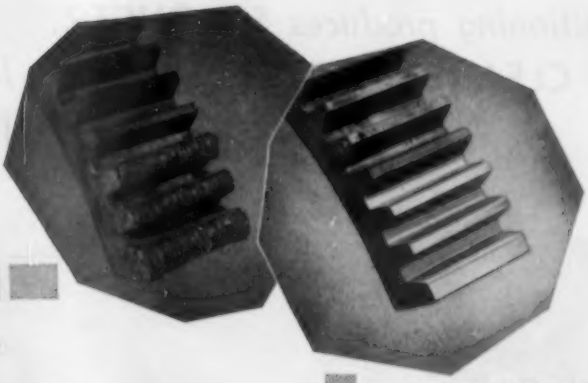
* * *

Hardfacing alloy

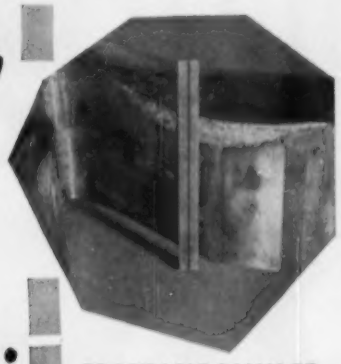
NEW series of alloy powders for hardfacing are said to produce improved deposit efficiency. Nos. 4, 5 and 6 are nickel-chromium-boron alloys. They are available in units of 5 lb, packaged in metal containers. *Wall Colmonoy Corp.*

Circle No. 21.

For more information use card on page 115



MACHINEABLE WELDS
... with Nickel-Arc



PROFITABLE SALVAGE
... with Nickel-Arc

FAST, ECONOMICAL REPAIRS ...
with Nickel-Arc

If you salvage, repair, or assemble Iron Castings... use NICKEL-ARC electrodes

Nickel-Arc is outstanding. No other electrode for welding cast iron gives *all* these benefits ... better machineability, no porosity, freedom from cracking and finest welding characteristics. Try Nickel-Arc in your own shop, on your toughest jobs and prove to your own satisfaction the superiority of this high quality electrode.

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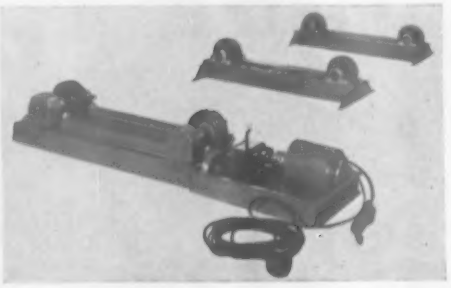
El Segundo, Calif.

no finer electrodes made ... anywhere

Positioning produces STRONGER, CLEANER, BETTER WELDS *in less time by eliminating* HANDLING

Light-duty Bench and Floor Model Positioners
Capacity 150 lb.

Single-Column Post-Types
Capacities from 500 lb. to 36,000 lb.



Powered Turning Rolls and Idlers
Capacities from 500 lb. to 75 tons

Frame Base Powered Turning Rolls
All wheels driving.
Capacities to 100 Tons.

Specializing in Custom Equipment
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122 SUMPTER STREET BROOKLYN 33, N. Y.

Welding guide

AUTOMATIC-welding guide light is designed to give a definite reference point for the accurate guiding of the submerged-arc welding head. It is an aid in eliminating weld repairs due to inadequate guiding methods, states the manufacturer.

In use, the light is rigidly attached to the welding head and moves with it. The spot of projected light is directed either into the weld groove or on a parallel edge. With the spot in sharp focus, the light serves as an indicator of the hidden weld position. It also indicates the height of the contact jaws above the work. *The Jimmie Jones Co.*

Circle No. 22.

* * *

Dust collector

"DUSTKOP" dust collector is for use where greater dust storage capacity is needed. Known as the "30NW50", it handles 3,600 cu. ft. of air per minute with a static pressure of 6 in. of water.

The collector can collect dust from almost any dust creating machine or operation, states the manufacturer. Addition of two rubber-caster, roller dust cans to the collector eliminates emptying dust bin by shovel. The collector is available as a recirculating air unit, or with attachments for outside exhaust. *Aget Mfg. Co.*

Circle No. 23.

* * *

Tip cleaners

"WYPO" tip cleaners for welding torches are now available in a new master set. It contains 21 cleaners and will clean 46 drill sizes, numbers 75 to 30 inclusive, states the manufacturer. *Maitlen & Benson, Inc.*

Circle No. 24.

Welding machine

"AIRCO" 800-amp, TCV rectifier arc welder is designed for Mig (metal inert-gas) welding. It has constant arc voltage for all automatic machine welding applications using constant speed wire feed, states manufacturer.

Machine has a three-phase transformer and a rectifier bank. Coils are aluminum wound, silicone and glass insulated. Forced draft cooling is provided by a fan. Arc voltage may be pre-set over a wide range from 15 to 44 arc volts. Once arc is established voltage automatically adjusts to the pre-set value. *Air Reduction Sales Co.*

Circle No. 25.

* * *

Magnetic clamp

"BUX" magnetic plate clamp is designed as an aid in fabricating metal plates. The clamp is 21 in. high and weighs 50 lb. It generates 3,000 lb of magnetic holding power, and can be attached or removed instantly from the job, states the manufacturer.

The clamp has a one-piece leverage rod and pressure stud mounted on a swivel. Smooth leverage control forces the metal surfaces into perfect contact. The clamp is portable. *Buck Mfg. Co.*

Circle No. 26.

* * *

Cleaning compound

"FM 184" is a mildly acidic compound for barrel deburring, descaling and derusting. The material is designed to replace raw acids in barrel operations where alkaline materials and abrasives are impractical.

The compound is said to improve color of steel after alkaline deburring, to remove heat scale from steel, and to brighten brass. It is claimed to have good foaming properties at recommended concentrations of 1 to 3 oz to a gal of water. It may be added dry to the burnishing barrel. *Oakite Products, Inc.*

Circle No. 27.

a helping hand means... better rods for you

Welding rods with RUFLUX* in the coating offer worthwhile advantages. What these advantages can mean depends upon which RUFLUX product is used. For RUFLUX is a TAM* trade name which stands for the highest quality Rutiles, Titanates and Zirconium compounds.

A TAM sales engineer can give you the facts quickly and accurately. He is technically trained and is familiar with the properties of the various TAM RUFLUX products. Furthermore, he is supported by a well-equipped and staffed research laboratory offering every available assistance.

This combination offers you a helping hand to better welding rods.

TAM PRODUCTS
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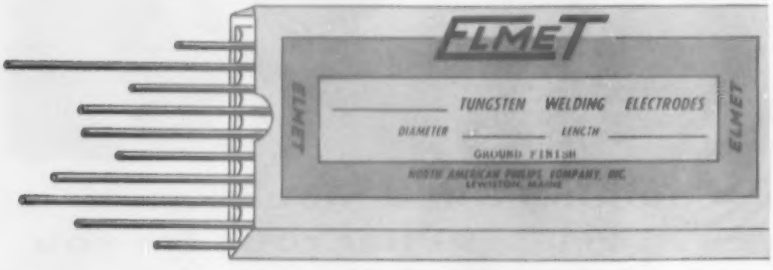
ALIKE AS TWO ELMET ELECTRODES

Nature does it without even trying, but on the production line it takes a lot of human skill to attain absolute uniformity. In the making of Elmet tungsten electrodes, however, the result is well worth the extra effort. For Elmet electrodes are completely uniform, not only in surface finish and dimensions, but more important, in their composition, characteristics and physical structure. This means that, with Elmet, you get consistently superior performance from electrode to electrode with a minimum in readjustment of equipment and voltage.

Elmet pure tungsten and thoriated tungsten electrodes are furnished in cleaned finish and in the mirror-smooth centerless ground finish. They are available in packages of 10 in all standard diameters from .040" to ¼" and from 3" to 18" in length.



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Metal bender

"METAL-WORKER" is designed for working steel, aluminum, copper, etc. It can bend or shear flat bars up and including 2 by 3/16 in. and shear angle bars of ⅛ in. stock up to and including 1½ by 1½ by ⅛ in. It cuts both ends square without distortion or fracturing, claims manufacturer. It is hand-operated. *Diesel Power Inc.*

Circle No. 28.

* * *

Welding gun

LIGHTweight, 14-oz., electric welding gun is for welding plastics of the thermoplastic group. It can also weld acrylics, styrenes and heat-seal soft vinyl sheet materials.

The gun operates on 110 volt, a-c, with choice of 180, 240 or 320-watt elements. The welding medium is usually electrically heated compressed air; nitrogen or carbon dioxide may be used. A valve controls the temperature. A special welding rod is available for polyethylene and polyvinyl chloride. *Seelye Craftsmen Industrial Plastics Div.*

Circle No. 29.

* * *

Flux

"AMCO C-Flux" is said to clean and flux in one operation, without precleaning. It contains no acid or grease. Flux is to be applied to the desired joint, after soldering, joint is wiped with damp cloth. 3-oz or 1-lb can sizes are available. *American Solder & Flux Co.*

Circle No. 30.

* * *

Electrode

NICKEL cast electrode is for repair welding of cast iron. The weld is said to be easily machinable under all conditions of deposition. The electrode can be operated from a-c or d-c. However, reverse polarity is recommended by the manufacturer. At all times welding current should be as low as possible. This electrode is claimed smooth-flowing with a good bead contour. *Pacific Welding Alloys Mfg. Co.*

Circle No. 31.

For more information use card on page 115

Alumin[illegible]um cable

"TWECO-LI[illegible]E" aluminum welding cable is lightwe[illegible]t and flexible. It is said to weigh on[illegible]-half as much as conventional cables.

Two grades are av[illegible]ilable—"SR" with a synthetic rubber [illegible]jacket, and "N-60" with a 60% neopr[illegible]ne jacket reinforced with rayon braid. "SR" is recommended for normal use; "N-60" where oil, heat, chemicals, abra[illegible]ion and rough usage are encountered. Both come in No. 4 through No. 4/0 sizes.

The cable is packaged in pre-cut 50 and 100 ft. lengths; also comes in 250 and 500 ft. coils and 1,000 ft. reels. *Tweco Products Co.*

Circle No. 32.

* * *

Mist collector

A VARIATION of the "Mistkop" mist collector has been developed. The new model has an exhaust shell for removing smoke through a pipe connection leading out-of-doors.

The exhaust shell surrounds the filter portion of the collector. It is designed so that loss due to air friction is kept at a minimum, giving enough pressure in the collector fan to force smoke out, without auxiliary fan equipment. *Aget Mfg. Co.*

Circle No. 33.

* * *

Transformer

LINE of special and custom-built transformers are for out-of-the-ordinary applications. "Multi-Amp" transformers are for welding, heating, testing, lighting, etc. These air-cooled units range in capacities from 5 va to 500 kva.

Units are light in weight, small in size and easy to install, manufacturer states. Mounted indoors, no additional fire protection is required. *Multi-Amp Corp.*

Circle No. 34.

Joining Metals?

Then **BRAZE** *Them For "No-Stress" Joining!*

With L.T. PHOSON & SILBOND*

Say good-by to metal joining stresses resulting from the high temperatures employed in bronze brazing or welding methods. Braze at low temperature the swift, sure stressless way!

PHOSON and SILBOND brazing of properly designed joints develops strength equal, or greater than the strength of the metals joined . . . not possible with soft solders. There are no extra finishing costs, no dangerous, unrelieved stresses which often result in welding techniques. There is no threading as in joining by fasteners, with attendant loss of strength.

Plus these important factors, consider the high electrical and thermal conductivity of Phoson and SilBond brazed joints, their excellent resistance to corrosion and the mass production methods to which these alloys lend themselves. If you join metals, you'll decide, as so many others have, to braze with Phoson and SilBond.

Ask for the PHOSON — SILBOND Booklet.

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You Can't Beat ATLAS Quality

The modern Atlas plant is devoted exclusively to building the finest weld cleaning tools in America. There are models to suit the man and every type work. If you haven't tried Atlas you don't know what a difference "balance and feel" can make in production and quality of work. They can take it.

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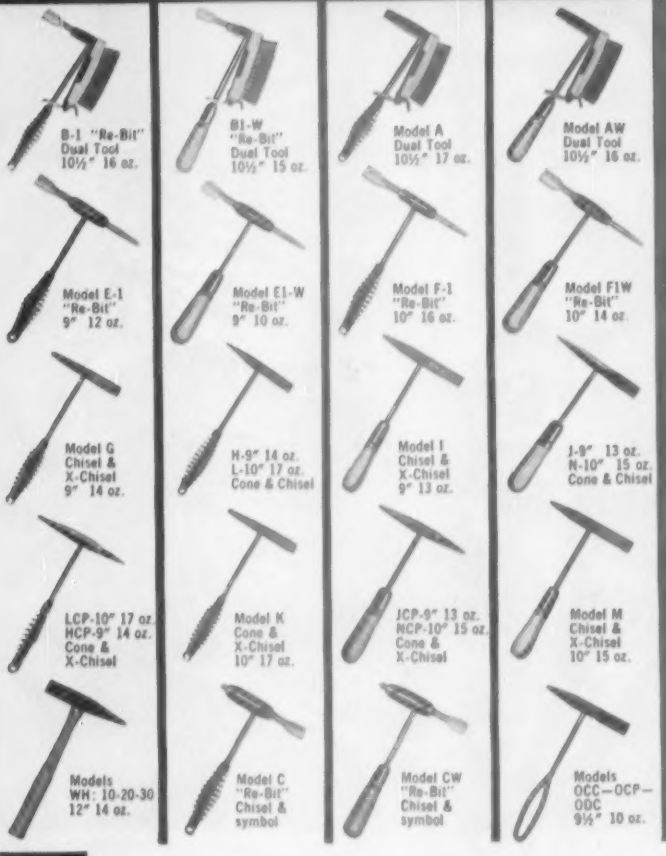
ASK YOUR WELDING SUPPLY DEALER TO SHOW YOU THE ATLAS LINE


B-1 "Re-Bit" Dual Tool 10½" 16 oz.
B1-W "Re-Bit" Dual Tool 10½" 15 oz.
Model A Dual Tool 10½" 17 oz.
Model AW Dual Tool 10½" 16 oz.
Model E-1 "Re-Bit" 9" 12 oz.
Model E1-W "Re-Bit" 9" 10 oz.
Model F-1 "Re-Bit" 10" 16 oz.
Model F1W "Re-Bit" 10" 14 oz.
Model G Chisel & X-Chisel 9" 14 oz.
H-9" 14 oz. L-10" 17 oz. Cone & Chisel
Model I Chisel & X-Chisel 9" 13 oz.
J-9" 13 oz. N-10" 15 oz. Cone & Chisel
LCP-10" 17 oz. HCP-9" 14 oz. Cone & X-Chisel
Model K Cone & X-Chisel 10" 17 oz.
JCP-9" 13 oz. NCP-10" 15 oz. Cone & X-Chisel
Model M Chisel & X-Chisel 10" 15 oz.
Models WH: 10-20-30 12" 14 oz.
Model C "Re-Bit" Chisel & symbol
Model CW "Re-Bit" Chisel & symbol
Models OCC—OCP—ODC 9½" 10 oz.

ASK YOUR WELDING SUPPLY DEALER

A good weld cleaning job performed with good professional tools will better reveal the quality of the weld

You Can't Beat ATLAS Quality

Metallizing gun

ELECTRIC metallizing gun works with an air pressure of about 100 psi. It is a compressed air tool made for connection to a welding generator. It is said to give high-pressure speed, better adherence and tighter films.

Termed the "EM-gun", it is designed to stand multiple-shift operation. It can be used in zinc and steel hardfacing applications.

Gun is easy to adjust, claims manufacturer. Current value corresponding to wire quality is set on transformer and feed speed is set with gun control. Gun is said to ignite immediately. Melting capacity is 55 lb. of zinc per hour with wire of 1/16 in. Two cables from transformer supply power. A rubber grip insulates the hand from welding voltage. *Arnold Serton, Inc.*

Circle No. 35.

* * *

Electrode

HARDfacing electrode "4T-S" is designed to deposit more metal than conventional rods, cutting application time, states manufacturer. Electrode is recommended for use on tractor track rails, grousers, and build-up of tractor rails—and generally for heavy duty equipment.

"4T-S" is a medium alloy, highly ductile rod that will not chip or spall from the base metal. Recommended application is by electric a-c/d-c. *Mir-O-Col Alloy Co.*

Circle No. 36.

* * *

Temperature indicator

"TEMPIL" temperature indicators are now being labeled with both Fahrenheit and Centigrade temperature ratings. The change reflects increased use of the Centigrade scale. A table of Fahrenheit and Centigrade equivalents is available. *Tempil Corp.*

Circle No. 37.

Electrode

"13-S" electrode is designed for a high speed rate of deposit on heavy-duty equipment. It is said to deposit one-third more metal than conventional type rods.

A self-hardening rod designed for electric welding, "13-S" is highly alloyed to produce a tough, shatter-proof deposit, states the manufacturer. It can be applied with a-c or d-c, reverse or straight polarity. It is available in several sizes. *Mir-O-Col Alloy Co., Inc.*

Circle No. 38.

* * *

Arc welder

ARC welder is engine-driven and is designed for field production and maintenance welding where work calls for light, rugged unit. It is available as models "GEA 200" and "GEA 200L."

Both models are suited for welding where a-c or a-c/d-c electrodes of 1/16 to 3/16-in. diameter are required. Rated welding current is 200 amp, 100 cycle, single phase with 100% duty cycle. Current range is 15 to 200 amp. Both models have air-cooled, 10 hp gasoline engines. *Air Reduction Sales Co.*

Circle No. 39.

* * *

Electrodes

BULK-packaging of electrodes in 2,000-lb corrugated boxes is said to have distinct advantages. Large users can now receive a carload lot in just twenty of these "Production-Paks".

Advantages are said to be, ease of handling in unloading, ease of storekeeping, better inventory control, easy stacking, better distribution, and no confusion of electrode brands.

The new boxes have a center divider and a full overlap top. They are secured by three steel straps with metal protectors on the sides. *A. O. Smith Corp.*

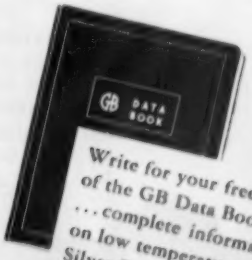
Circle No. 40.

For more information use card on page 115

Speed • Efficiency • Economy

GB 88 Flux, an aid in silver brazing operations, a time-tested product, assures you of maximum protection and high quality joints. Team up a GB Alloy and Flux for dependable results. Other GB Fluxes available for specialized application.

...GB Silver Brazing Alloys meet all standard specifications. Available in random coils, strip, preformed rings and special shapes. This is your answer to sound, leak-proof joints on virtually any ferrous or non-ferrous metal. Silver Brazing Alloys are easy to use in production, save time, labor and assure dependable results.



Write for your free copy of the GB Data Book ...complete information on low temperature Silver Brazing.

Dealer Distributor inquiries invited

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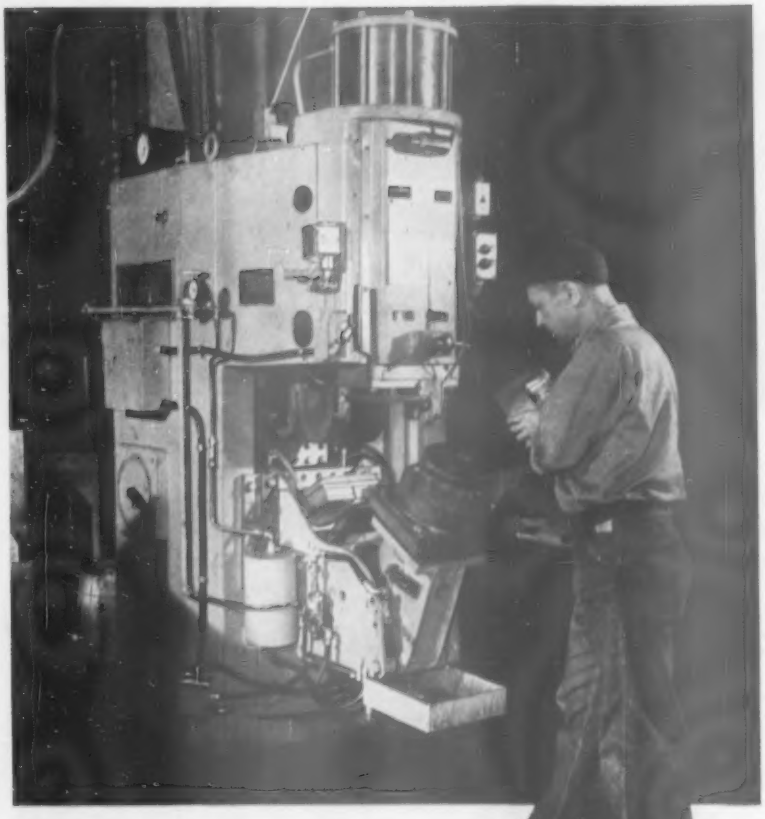


HOW FEDERAL HELPS
BINGHAM-HERBRAND
BUILD BETTER ASSEMBLIES

Bingham-Herbrand, Toledo, O., is one of the nation's foremost suppliers of fabricated parts and assemblies for the automotive and appliance industries. To maintain constant high quality, yet keep their prices competitive they must continually work at controlling their costs.

It's this cost consciousness that has brought them to rely on Federal Resistance Welders. Their records show they get more production at less cost from Federal equipment.

Bingham-Herbrand is not alone in this respect . . . for wherever resistance welding units are a major operation and costs are important, you'll find machines by *Federal — First in Resistance Welding.*

Before and after shots of a power unit case for appliance application
Fifteen separate parts are welded together to make a completed unit

Federal WELDERS

Warco PRESSES

THE FEDERAL MACHINE AND WELDER CO.
WARREN, OHIO

Timer

ELECTRONIC timer is said to have excellent repeat accuracy. Known as "T-1," it permits multiple operation, including interval, delayed action, repeat and single cycle timing.

Timer can be supplied in standard time ranges of 0.3-25 seconds or 0.5-50 seconds. 270-deg dial can be removed for remote operation. No stand-by power is needed; cold cathode tubes cut warm-up time. *Ferrara Inc.*

Circle No. 41.

* * *

Metal cleaner

"OAKITE" stripper No. 110 is a two-phase solvent material designed for removal of zinc-chromate primers from aluminum. It does not affect the metal surface, states the manufacturer.

The stripper is used full strength. The part to be stripped is immersed completely in the solvent, under the surface oil seal, which should be maintained continuously. The stripper has a flash point of 290 F and is recommended for use when heated to 140 to 180 F. A pressure water rinse, warm or cold, is desirable for floating off loosened paint. *Oakite Products, Inc.*

Circle No. 42.

* * *

Thyratron

"NL-5560" is an indirectly heated cathode, shield grid, 2.5-amp, d-c thyratron. It is mercury-vapor filled for long life.

The thyratron's ratings are: heater volts, 5; heater current, 4.5 amp; peak inverse and forward volts, 1,000; average anode current, 2.5 amp; peak anode current, 15 amp; anode averaging time, 15 seconds; cathode heating time, 5 minutes. *National Electronics, Inc.*

Circle No. 43.

* * *

Grinder

"STUBBY" multipurpose bench grinder is designed for light grinding. Known as "Model D4," the grinder is claimed particularly useful where slower or faster than normal motor speeds are necessary.

Housing is cast-aluminum alloy with blue hammertone finish.

Spindle is ½-in. in diameter and 11⅛-in. long. Wheel capacity is 6 in. Polishing, buffing, sanding, brushing and finishing wheels of all types may be used, as well as those for removing metal. *Poly Products Co.*

Circle No. 44.

No. 89 The RIGHT FLUX for the JOB No. 20

No. 47 No. 18C

BACKED BY 60 YEARS OF TESTED PERFORMANCE

Whatever the particular job you have to do—we have the right FLUXINE you need. Besides our 25 FLUXINES we carry a complete line of "KOP-R-ARC" coated rods for welding copper and all copper alloys.

Write on company letterhead for chart and generous sample stating which FLUXINE desired.

KREMBS & COMPANY
(Est. 1875)
Dept. J, 669 W. Ohio St., Chicago 10, Ill.

NEW PRODUCT BRIEFS

Pocket-size explosive-gas indicator is for use where a quick spot-check for combustible gases or vapors is needed. Presence of combustibles is indicated by intermittent flashing of the bulb. *Davis Emergency Equipment Co. & Hogart Engineering Co.*
Circle No. 45.

* * *

"Plastik-Tul," a viscous, metal-filled plastic material, can be used for fast and economical production of jigs, fixtures, plugs, gages, forming dies, holding fixtures, masking fixtures, etc. *Industrial Development & Mfg. Corp.*
Circle No. 46.

* * *

"Tweeten" mechanical marking pencil is said to mark on any surface. Plastic barrel is 5½ in. with pocket clip; comes in several colors. *Tweeten Fibre Co., Inc.*
Circle No. 47.

* * *

Swing-clamp assembly, made for moderate to heavy-duty holding power, is said to give positive, safe, low-cost clamping of close-quarter work on rough, finished or irregular surfaces. *Jergens Tool Specialty Co.*
Circle No. 48.

insist on famous "Jorgensen" AND "Pony"

CLAMPS

Ask your supplier

SEND FOR FREE 32-PAGE CATALOG.

ADJUSTABLE CLAMP CO.
"The Clamp Folks"
426 No. Ashland Ave. • Chicago 22, Ill.

Tempilstik° FOR ALL HEAT-DEPENDENT OPERATIONS

looks like a crayon... marks like a crayon... tells temperatures like a precision instrument!

Sixty-three different compositions enable you to determine and control working temperatures from 113° to 2000° F. TEMPILSTIK° marks on workpiece "say when" by melting at stated temperatures—plus or minus 1%.

ALSO AVAILABLE IN LIQUID AND PELLET FORM... WRITE "WELDING SALES" DEPT. FOR SAMPLE TEMPIL° PELLETS... STATE TEMPERATURES OF INTEREST—PLEASE!

Tempil°
CORPORATION
132 WEST 22ND STREET, NEW YORK 11, N. Y.

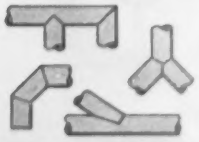
Available in these Temperatures (F.)

113	375	1000
125	388	1050
138	400	1100
150	413	1150
163	425	1200
175	438	1250
188	450	1300
200	463	1350
213	475	1400
225	488	1450
238	500	1500
250	550	1550
263	600	1600
275	650	1650
288	700	1700
300	750	1750
313	800	1800
325	850	1850
338	900	1900
350	950	1950
363		2000

Visit us at Booth 1533—Oct. 17-21
Nat'l Metal Exposition
Philadelphia

LAY OUT ANY PIPE JOINT

LAY OUT ANY PIPE JOINT, SHOWN BELOW, on any size pipe from 1½" to 48"



Mark Structurals
Adapter for marking structural angles included with either model of the Contour Marker.

The proven, fast easy way

IN LESS THAN 5 MINUTES you can lay out a Y, a T, an L or any angle joint with a Contour Marker. IT'S EASY and absolutely accurate; it is calibrated in both degrees and pitch. Just set the angle and with a smooth swing of the Contour Marker's soapstone point you are ready to cut! You save "man hours" as well as oxygen and acetylene gas because "cut and try" methods are eliminated.

Two Sizes: Standard, for pipes 1½" to 18" dia.; Jumbo, for pipes 16" to 48". Instruction book included. Belt case available. Write for information.

Sold by welding supply dealers everywhere.

CONTOUR MARKER CORP. OF CALIFORNIA
1843 East Compton Boulevard, Compton, California

BOYCE CENTERING HEAD marks center line at any degree of angle on pipe, shaft, tube. Leveling gauge on dial.

24" RADIUS MARKER is folding compass of Dural aluminum. Folds to 9¼" pocket size; weighs 8 oz.

PIPE FLANGE ALIGNER expands and centers inside pipe to align flange for welding. For any pipe dia. 3" to 12"

THE *Original* CONTOUR MARKER
ACCURACY PROVED BY TEN YEARS OF SERVICE TO WELDERS

Sales Leads in the Welding Market?

WELDING ENGINEER has developed more than 25,000 such leads since the first of the year. It is your best weapon for hitting the target . . . top editorial quality; ABC-audited paid circulation; *worldwide* readership; readers with buying power!

These are just a few of the reasons why YOU should use WELDING ENGINEER as your sales messenger.

Write or phone

WELDING ENGINEER

12 E. Grand Ave. - Chicago 11, Ill. - DElaware 7-0339

NEWS . . . . . *from page 6*

expected increase in demand during the hot months (partially blamed on buildup of inventories), and the heat also caused some cut in production. Brief though it was, the 48-hour shutdown just prior to the new agreement between labor and management was another reason for low supplies.

The havoc wreaked by floods in the East is given as still another reason. The emergency has made that region call for large amounts of structural steel.

Although most sources believe that plate is scarcer than other types, they all agree that the overall picture is none too good.

* * *

Superweld Corp. forms subsidiary

Western Carbide Corp. was recently formed as a subsidiary of Superweld Corp., North Hollywood, Calif. It will manufacture and market proprietary products. The new corporation is making a hardfacing paste and several hardfacing bulk products.

* * *

Kaiser Aluminum plans refractory brick plant

Contracts have been let for the construction of the new Columbiana, Ohio, basic refractory brick plant of Kaiser Aluminum & Chemical Corp., Oakland, Calif. The projected 160-acre plant will produce high temperature basic refractory brick for the steel, glass, cement and copper industries. It is expected to be completed by late 1956.

* * *

Industrial Hydraulics conference in the Fall at Chicago

The 11th annual National Conference on Industrial Hydraulics will be held Oct. 27 and 28 at the La Salle Hotel, Chicago. It is sponsored by Illinois Institute of Technology, in cooperation with a number of engineering societies and nearly 100 industrial organizations.

* * *

Budd Co. to make and sell Gamma Corp. products

The Budd Co., Philadelphia, will manufacture, sell and service the gamma radiography equipment and sources previously produced by The Gamma Corp., Mansfield, Mass. Dr. A. J. Stevens, formerly president, C. F. Thompson, formerly vice-president, and T. W. Healy, formerly treasurer of Gamma Corp. have joined The Budd Co.

Union Carbide forms atomic division

Union Carbide Nuclear Co., a division of Union Carbide & Carbon Corp., has been formed to unify the firm's diverse activities in the atomic energy field. The new company will carry on large-scale research and development activities.

Kenneth Rush, a vice-president of Union Carbide, has been appointed president of the new firm. Lyman A. Bliss, Clark E. Center, and Oscar F. Holmgren have been named vice-presidents. Offices are in New York City.

* * *

New welding method for rotating bands

A new technique of welding rotating bands for artillery projectiles was announced recently by the American Ordinance Association, Washington, D. C. Under the new system, overlays are deposited on projectiles by the Mig (metal inert-gas) welding process. It has proved satisfactory for thin-walled sheets and for other types of artillery ammunition.

* * *

Metals and ceramics lab opened by GE research

A new metals and ceramics processing laboratory was recently dedicated at General Electric Co.'s research facility, Schenectady, N. Y. The new building, which has more than 75,000 sq ft of floor space, duplicates the factory process which will aid in the experimental testing of new data. The facility will concentrate on metallurgical and ceramic research.

* * *

Hardfacing

—Courtesy Wall Colmonoy Corp.

FOURTH place in Texas contest sponsored by Future Farmers of America was won by a team of three high-school boys, shown here with their teacher, T. D. Scroggins (right). The team chose hardfacing of farm implements as its project. Welding is part of agricultural shop course at Kyle high school, which boys attend. From left, they are H. J. Schnoutz, Carvel Brooks and Carl Reneau.

FEDREX

120s

for X-Ray Spot Checks

- Short Exposures
- Easy Handling
- Economical
- Lightweight
- Weatherproof

FOR USE IN FIELD

A new low-cost, lightweight, portable, 120 kvp. 5 ma X-ray unit especially designed for spot checking welds in accordance with API Specifications for Welded Tanks, API Standard 12c—12th Edition.

The small dimensions (14 in.) and light weight (75 lb) of FEDREX 120s make it easy to handle, even in cases of field welds not readily accessible. Also available in 160, 200 and 260 kvp sizes.

Write today for complete details and prices

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FOR BEST RESULTS USE

Silvaloy

Silver Brazing Alloy preforms for Production Brazing. Rings, Stamped or Coined Washers and Wire Forms

All inquiries given immediate attention and shipments made on short notice. Technical service men are available to assist you in proper joint design. Silvaloy brazing alloys also available in wire, strip, and powder from stocks in six branch warehouses.

1200 FLUX

Use when silver brazing Brass, Bronze, Copper, Nickel-Silver, Steel, Stainless Steel, Monel, Nickel, Inconel and other Nickel alloys. Furnished in ½ lb., 1 lb., 5 lb., 30 lb., and 65 lb. containers.

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PLANTS: DETROIT, ST. LOUIS, MILWAUKEE, MINNEAPOLIS, INDIANAPOLIS

OFFICES: KANSAS CITY, GRAND RAPIDS

Stops moisture pick-up

Your cheapest insurance against wasteful defective welds is DryRod. This oven protects low-hydrogen, austinetic, and other special alloy electrodes, as well as the new iron powder contact rods, against moisture.

DryRod contributes to steady welding, less slowdown, less re-work, less scrap. It can pay for itself out of rod salvage alone. Operating cost is less than 15c per 24 hours.

DryRod is completely wired, ready for use. Automatically controlled temperatures adjust from 175° to 550° F. for storage or re-baking.

Three sizes available . . . 10-lb.-capacity portable . . . standard 350 lb. (shown here)... large 900 lb. Type 300 and 900 quickly convert for pre-heating, drying, tempering, drawing of small die parts, and other industrial uses.

DryRod—Trademark X-DR-16

Cut costs 4 ways with DryRod Method!

1 Store sealed cartons in warm, dry place.

3 Locate DryRod as close to welding operations as possible.

2 Place unpackaged electrodes in DryRod Oven and withdraw as needed.

4 For flexible, large-volume storage, stack ovens with compact DryRod Stands.

For details, see your welding supply dealer or write . . .

DryRod DIVISION OF **Phoenix Products Co.**
4715 N. 27TH ST. MILWAUKEE 16, WIS.

If you are looking for **PERFORMANCE**
PLUS **ECONOMY**
in an **ELECTRODE HOLDER**

INSIST *on your dealer showing you a*

HI-AMP

The PI-5 HI-AMP shown here, is the most economical 500 amp. Electrode Holder on the market by far—and you can easily prove that statement by insisting on your dealer showing you this new model. It was developed especially for iron powder "contact" rods, as well as hard surfacing rods. Note too its extra heavy lower jaw which allows heat to be absorbed, thus insuring longer life—weighs only 26 ozs.

Yes, just check the many outstanding advantages of all HI-AMP products and you will quickly learn why welders everywhere now insist on HI-AMP Electrode Holders and Clamps for outstanding performance *plus* economy!

Sold only through Welding Supply Distributors in the U. S. and Canada

WAGNER MANUFACTURING CO.
250 W. 3rd SOUTH ST. JACKSON, MISSOURI

Weld with Wagner

Dix Engineering starts monthly news letter

Dix Engineering Co., Lincoln Park, Mich., (near Detroit) has begun publication of a monthly illustrated news letter service to the industry. The publication will include instances of the firm's emergency services—welding, engineering and metallizing.

* * *

Willson Products buys plastics firm

Willson Products, Inc., Reading, Pa., recently purchased assets of Paramount Rubber Co. and Paramount Plastics Co., both of Detroit. The two firms will operate as the Paramount plastic division of Willson Products. They will remain in Detroit.

* * *

New Albany Welding moves into new plant

New Albany Welding Works, Inc., Jeffersonville, Ind., has moved into its new plant located on Broadway Ave., north of Jeffersonville. The new plant affords increased storage, manufacturing, and office facilities.

* * *

Power show to be held in Chicago Nov. 14-18

The Chicago Exposition of Power & Mechanical Engineering will be held Nov. 14-18 at the Coliseum, Chicago. It is sponsored by the American Society of Mechanical Engineers, as a part of the Diamond Jubilee Annual Meeting concluding the Society's 75th year.

The exposition will cover every phase of power generation and industrial use, including electric motors, speed reducers, electrical testing instruments and automatic controls.

* * *

RWMA nameplate available for use by members

A special metal plate has been developed by the Resistance Welder Manufacturers' Association for use by members on machines they produce. The plate indicates that the manufacturer of the welding machine is a member of RWMA.

* * *

Electronics conference to be in Chicago

The 11th annual National Electronics Conference is scheduled to meet October 3, 4 and 5 at the Hotel Sherman, Chicago. The program will cover the field of electronic research, development and industrial uses.

Radioactive pellet detects flaws in steel rods

X-Ray Engineering Co., Mill Valley, Calif., has been using a highly radioactive pellet instead of an X-ray machine for locating flaws in reinforcing steel rods on the Embarcadero Freeway ramp in San Francisco.

Using a pellet of cesium, Bob Williamson of the firm took photographs of the interiors of the 2-in. thick rods to see if there were any defects at spots where new rods were welded onto remains of the old.

Photographs are taken by tying a film strip on one side of a rod at the weld. The pellet is placed in an aluminum cup about 10 in. from the rod opposite the film. The pellet remains near the film for 11 minutes.

The film is then developed on the spot. The image produced is similar to that of X-ray. But the process is said to be quicker. The cesium is capable of penetrating 7½ in. of steel.

* * *

Lord Chemical builds welded storage addition

A new 6,000 sq ft storage addition was recently completed at the Lord Chemical Corp.'s plant at 2068 S. Queen St., York, Pa. The new two-story wing, of reinforced-steel, cinder-block construction, measures 60 ft long by 50 ft wide. Weight of the upper story is supported by four rows of welded columns of 4-in. extra-heavy pipe.

Each of the 17 pipe columns was welded to ¾-in. steel base and top plates, 13 by 13 in.

* * *

Immense coupling

—Pipe Line Development Co.

LARGE 72-in. welded safety couplings were recently shipped to a large steel firm in the Midwest. They are for use on coke oven gas pipelines. Such couplings rejoin pipelines so that flow can be resumed immediately at full pressure, even before welding.

Alloy Rings

cut Brazing Rejects to less than 1% in Refrigerator Compressor Dome Assembly

* Actual photo of refrigerator plant production line where 11 joints are brazed on one assembly with less than 1% rejected under Underwriter's pressure test of 1500 lbs. per sq. in.

Alloy brazing materials insure a perfect job every time . . . consistently uniform, trouble-free brazing with no rejects . . . no reworking!

No question about it—Production Brazing with Alloy Rings is the practical answer to many expensive metal joining problems. Investigate . . . production brazing can help you conquer those sky-high production costs.

Precision is of the utmost importance in successful brazing. For infallible results insist on precision-made Alloy Rings. Special Alloy packaging methods speed production and cut waste to a minimum.

Write for full information on brazing rings, preformed shapes, silver alloy, copper, soft solder and flux.

Alloy RINGS

ALLOY RING SERVICE, INC. • 1075 EAST 52ND STREET • INDIANAPOLIS 5, INDIANA

40 YEARS with WELDING

Welding has changed the world's concept of metal joining during these past 40 years.

All the milestones of this great achievement will be depicted in WELDING ENGINEER's big 40th Anniversary Issue, which will commemorate the four decades that it has served the industry.

Closing date: Dec. 5.

Contact your local representative or write

WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill.

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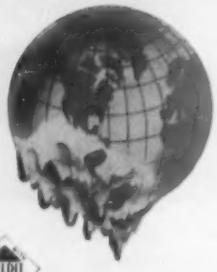
THE WORLD'S FINEST
SALAMANDER
USED the WORLD OVER!



Weldit, Inc. proudly introduces their new L-P "Heaterama" Salamander, Model #900. Designed to give maximum high heat output at low cost, it features the famous "Flame Dome" for 360 degree heat distribution and 100% automatic safety shut-off. Floor type Model #800 and Tank Top Model #1850 also available.

Weldit INC.
SINCE 1918

990 OAKMAN BLVD.
DETROIT 38, MICHIGAN

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

FOR WELDING AND CUTTING...

IN THE RED DRUM

HIGHEST QUALITY

DUST-FREE

AN AIR REDUCTION PRODUCT

NATIONAL CARBIDE

Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

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A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

Alloy Casting Institute elects officers

Thomas Rutherford, The Midvale Co., Philadelphia, was recently elected president of the Alloy Casting Institute, New York City. He succeeds C. K. Lockwood, vice-president of Stainless Steel & Alloys Div., Shawinigan Chemicals, Ltd., Montreal. Two new members named to the board of directors are: H. J. Cooper, Cooper Corp., Hillside, N. J., and F. M. Fahrenwald, The Fahralloy Co., Harvey, Ill.

* * *

Covered railroad car is welded

The Greenville Steel Car Co., Greenville, Pa., has developed a standardized 70-ton covered hopper railroad car. Hopper cars are used principally for the bulk transportation of cement, potash and other materials which must be kept dry.

The standard design is the result of extensive research. An important feature of the cars is the welded construction, said to cut fabrication time. The cars have a capacity of 2,003 cu ft. Rivets are held to a minimum, being used where welding is not feasible.

The entire side construction is preassembled off car. About 2/5 of the lineal footage of the welding for the cars is done by horizontal automatic welding.

* * *

Atomic parts plant unveiled in Pennsylvania

An atomic parts manufacturing plant started production recently at Cheswick, Pa. It is operated and owned by Westinghouse Electric Corp., Pittsburgh. The plant, which produces parts for atomic power plants, has a manufacturing area of 87,000 sq ft.

An important part of the plant is a high pressure "proving ground" designed for testing of motor-pumps and valves used in nuclear power plants.

* * *

Aptitude tests predict success of weldors

New aptitude tests published by Science Research Associates, Chicago, are said to predict on-the-job success of prospective weldors.

Use of these tests, designed for workers in the machinery industry, is claimed to bring about considerable savings through improved performance, higher production, and reduced labor turnover. Each of the 14 tests is said to be easy to administer individually or in groups. Cost is nominal.

COMING EVENTS

OCT. 17-21: National Fall Technical Meeting, American Welding Society, Bellevue-Stratford Hotel, Philadelphia.

OCT. 17-21: Thirty-seventh Annual National Metal Exposition and Congress, Convention Halls, Philadelphia.

OCT. 17-21: National Safety Congress, Conrad Hilton Hotel, Chicago.

OCT. 18: NWSA Luncheon Meeting (Metal Show), Bellevue-Stratford Hotel, Philadelphia.

OCT. 31-NOV. 1: West Central Zone Meeting, NWSA, Hotel Phillips, Kansas City, Mo.

NOV. 3-4: Western Zone Meeting, NWSA, Ambassador Hotel, Los Angeles.

NOV. 28-30: Annual Fall Meeting, Independent Oxygen Manufacturers Association, Edgewater Beach Hotel, Chicago.

DEC. 5-6: Southeastern Zone Meeting, NWSA, The Dinkler Plaza, Atlanta, Ga.

DEC. 8-9: Southwestern Zone Meeting, NWSA, Shamrock Hotel, Houston.

JAN. 1: Fortieth Anniversary of WELDING ENGINEER.

FEBRUARY (Dates to be announced): Welding Conference, University of Wisconsin, Madison.

FEB. 1-2: Second Annual Midwest Welding Conference, Armour Research Foundation of Illinois Institute of Technology, Chicago.

MARCH 12-14: Fifty-sixth Annual Convention, International Acetylene Association, Hotel Statler, Los Angeles.

MARCH 19-22: Twelfth Annual Convention, National Welding Supply Association, Hotel Roosevelt, New Orleans.

MAY 8-11: Thirty-seventh Annual Meeting, American Welding Society, Hotel Statler, Buffalo.

MAY 9-11: Fourth Annual Welding Show, Memorial Auditorium, Buffalo.

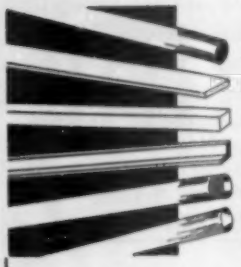
National Electronics reports sales gain

National Electronics, Inc., Geneva, Ill., has reported first half shipments for 1955 were 58% above the 1954 rate. The present high volume is expected to continue through the fourth quarter. Much of the sales gain is concentrated in the thermal ignitron line.

* * *

Spincraft Inc. buys Felcon Tool & Die

Spincraft, Inc., Milwaukee, recently purchased Felcon Tool & Die Co., Milwaukee. Felcon will operate as the Felcon Division of Spincraft, Inc. Joseph Konecny, former owner of Felcon, will head the new division. Felcon manufactures tools, dies, jigs and fixtures.



Bend ALL These on ONE Machine the HOSSFELD UNIVERSAL® IRON BENDER

Wrenchless, the Hossfeld Bender is always ready for use. It's easily and quickly set up for 101 different bends needed every day in maintenance and production work. Adaptable, it replaces special bending equipment. For those hard-to-pull bends on heavier material, a Hydraulic Attachment (available optionally) enables one man to do the job.

GET THE FACTS!

Write today for bulletin showing bender models, special dies, and illustrations of bar, angle iron and pipe bends.

Sample bendings of:

- Bar
- Angle Iron
- Pipe

Hossfeld Mfg. Co.

446 W. 3rd St.
WINONA, MINNESOTA

FOR QUALITY WELDMENTS use Drawalloy CORPORATION

QUALITY CONTROLLED STAINLESS STEEL WELDING WIRE

- **available in Spools, Coils and Lengths**
- **for Automatic and Semi-Automatic gas and inert arc welding**

Welding wire by Drawalloy is made to an exacting high standard . . . a high standard established by long-experienced welding men who know welding wire and how it must work. Set-ups for automatic and semi-automatic welding take more time than regular welding. That's why you want to be sure of satisfaction *before* you start. This *reliable* wire is weld-tested to give the best results every time. Write today for complete information and prices.

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chine over the pipe and snap in place . . . light the torch . . . give the hand crank a few turns . . . and the job is done — the maximum SPEED WITH ACCURACY. Joe had a few choice words for those reject welds too . . . the H & M certainly could have saved him a lot of fuss and bother. If you're in the same fix as Joe get all the details . . .

WRITE FOR THE FREE FOLDER
"MORE PROFIT DOLLARS IN PIPE FABRICATION"

H&M PIPE BEVELING MACHINE CO.

Trade Mark Reg. U.S. Pat. Off.
311 E. 3rd. St. • Ph. 3-0241 • Tulsa, Ok.

It's in Milwaukee, not St. Paul

On page 6 of our September issue, we inadvertently placed the Acro Welder Mfg. Co. in St. Paul. The firm, which recently moved to larger quarters on *St. Paul Avenue*, is located in Milwaukee.

* * *

Distributor appointments

Carhoff Co., Cleveland: Safety Equipment Service Corp., Richmond Hill, N. Y.; Spokane Safety Appliance Corp., Spokane, Wash.; Sterling Dockson Co., Detroit.

Heath Engineering Co., Fort Collins, Colo.: James West of W & S Service Engineers, Inc., Blue Island, Ill., is the new factory representative in the Midwest and South for flame-cutting machines.

K-G Equipment Co., Inc., Allentown, Pa.: Austin Oxygen Co., Austin, Texas; Central Welding Sales Co., Hamilton, Ontario, Canada; Claudin Welding Supply Co., Champaign, Ill.; Fayette Oxygen & Supply Co., Uniontown, Pa.; Harris Welding & Service Co., Camden, N. J.; Medico Electric Motor Co., Pittston, Pa.; Tri-State Welding Supply Co., Keokuk, Ia.; Welding Process Equipment Co., Chicago; Philip Wolf & Son, Lewistown, Pa.; National Welding Supply Co., Mobile, Ala.; Tanders & Stewart, Jackson, Mich.; Tex-Air Gas Co., Amarillo, Texas; W & S Service Engineers, Joliet, Ill.; Welders Service & Supply Co., Cincinnati.

Miller Electric Mfg. Co., Appleton, Wis.: Johnson Welding Equipment Co., Inc., Chicago.

Vanton Pump & Equipment Corp., Hillside, N. J.: D. B. Gooch Associates, Birmingham, Ala.

W & S Service Engineers, Inc., Blue Island, Ill. has appointed the following as distributors for Heath Engineering Co.: C. A. Schrader Welding Supply, Mishawaka, Ind.; Wayne Welding Supply Co., Inc., Fort Wayne, Ind.; Modern Engineering Co., St. Louis, Mo.; Jacobs Welding Supply, Davenport, Ia.; Minnesota Oxygen Co., Minneapolis; Viking Welding Supply Co., Milwaukee; International Welding Sales Co., Marinette, Wis.; Valley Welding Supply, Inc., Appleton, Wis.; Johnson Welding Equipment Co., Inc., Chicago; D & R Welding Supply Co., Decatur, Ill.; H. R. McGarvey Co., Pekin, Ill.; Post Welding Supply Co., Birmingham, Ala.; Welders Supply Co., Little Rock, Ark.; Brooks Welding Supply Co., Chattanooga, Tenn.

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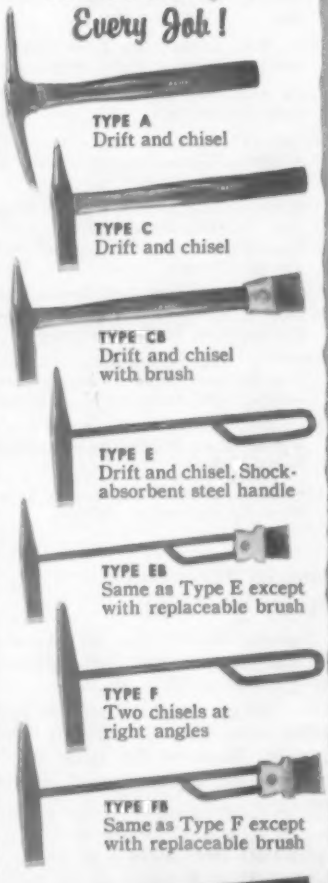

TYPE A
Drift and chisel

TYPE C
Drift and chisel

TYPE CB
Drift and chisel with brush

TYPE E
Drift and chisel. Shock-absorbent steel handle

TYPE EB
Same as Type E except with replaceable brush

TYPE F
Two chisels at right angles

TYPE FB
Same as Type F except with replaceable brush

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1912 West 46th Street
Chicago 9, Illinois

Russell T. Lund has been appointed a vice-president of National Carbide Co., division of Air Reduction Co., Inc., New York City. He was formerly operating manager of National Carbide. He will continue to headquarter at Calvert City, Ky.

* * *

Frank B. Snedecor has been named manager of the Niagara Falls, N. Y., plant, Titanium Alloy Manufacturing Division, National Lead Co., New York City. Mr. Snedecor was formerly controller and assistant to the division manager. He succeeds *Robert B. Easton* who has retired. *Clare A. Best*, formerly chief chemist for the Division, has been appointed director of quality control. *Karl W. Traub* succeeds Mr. Best as chief chemist.

Snedecor

* * *

Combustion Engineering, Inc., New York City, has made the following promotions. *Carmine J. Grossi* from assistant general sales manager to manager of the export division; *Frank J. Bader*, formerly district manager at San Francisco, to assistant general sales manager in New York City; *Herman C. Reichard* from the Kansas City sales office to district manager in San Francisco.

* * *

C. S. Wiedman has been appointed manager of carbide products development engineering, Carboloy Department, General Electric Co., Detroit. He will be responsible for directing the metallurgical development of carbide materials and related processes.

* * *

Joseph E. Seibold was recently named manager of Worthington Corp., Harrison, N. J., merchandising division. Mr. Seibold has been associated with the firm since 1924. He succeeds J. O. Glenn, who has resigned to establish a private enterprise in Florida.

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with special product solutions (86 of them★)
to industry problems occurring widely

Buyers Guide to the complete line of
ALL-STATE Alloys and Fluxes for welding
brazing, soldering, cutting, tinning

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15 improve work on aluminum and aluminum alloys. The number for cast iron is 10. For copper and copper-bearing alloys - 12 . . . for nickel - 8 . . . . for stainless steel —10 . . . for steel - 20 . . . . . for variety of metals - monel - magnesium - zinc die cast - 11

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FIRST TRULY PORTABLE
200 AMP. ARC WELDER
Weighs only 65 lbs.; carry it to the job!
Using the first ***TOROIDAL*** *transformer!*

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MODEL 200 AW

OBSOLETES ALL OTHER
WELDERS OF COMPARABLE RATING!

Employing the first toroidal transformer ever used in arc welders, the portable Bren-Weld does the work of conventional welders 4 to 5 times its size and weight. Eliminates the necessity to transport bulky equipment or heavy parts to be welded. *Now you can carry Bren-Weld to the job!*

Bren-Weld handles electrodes from 3/64" through 5/32"; it has adjustable arc voltage for various arc characteristics.

Because it is so flexible in operation and application, Bren-Weld is ideal for plant production and maintenance, for construction work, for railroads, on the farm and in home workshop.

24 HOUR DELIVERY FROM STOCK!

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- *Also Available For 220/440 Volts*
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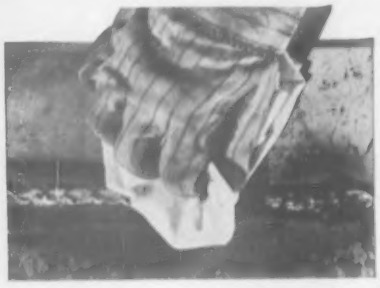

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John H. Poulson was recently appointed regional manager for All-State Welding Alloys Co., Inc., White Plains, N. Y. His territory covers the New England states and eastern New York state exclusive of the metropolitan area. Mr. Poulson is a member of the American Welding Society.

• • •

Howard A. Miller has been appointed assistant chief metallurgist of the Cleveland steel plant of Republic Steel Corp., Cleveland. Mr. Miller will be in charge of metallurgical operations at the firm's 98-in. strip mill. He is a member of the American Welding Society.

• • •

Arthur E. Darcy, abrasive belt machine specialist, has been named manager of the Machine Methods Dept., of the Coated Abrasives Div., of The Carborundum Co., Niagara Falls, N. Y. Mr. Darcy has been a field engineer for Porter-Cable Machine Co., specializing in abrasive belt grinders, and prior to joining Carborundum, was a sales engineer for Beals, McCarthy & Rogers, Buffalo, N. Y.

• • •

L. W. Buechler has been named chief engineer for Vickers Electric Div., Vickers Inc., St. Louis, Mo. Mr. Buechler was formerly manager of control product sales for the division.

• • •

Neil E. Kile has been appointed plant manager of the Clinton, Mass., plant of The Colorado Fuel & Iron Corp., New York City. Mr. Kile formerly was sales and product manager of the mechanical specialties department. *Ralph W. Ramer* succeeds Mr. Kile as sales and product manager.

• • •

William H. Thomas, Allentown, Pa., manager of government sales for Air Products, Inc., has been appointed director of the general industrial equipment div., Business and Defense Service Administration, U. S. Department of Commerce. Mr. Thomas succeeds *Everett O. Clark*, of Birmingham, Mich. Prior to joining Air Products, Inc., Mr. Thomas was associated with National Cylinder Gas Corp., Chicago; Puritan Compressed Gas Co., Kansas City; Heidbrink Co., Minneapolis.

W. C. (Bill) Robinson has been appointed assistant sales manager of Tube Turns, division of National Cylinder Gas Co., Louisville, Ky. *Frank Briggs* has been appointed to the staff of the company's sales development department.

Robinson

* * *

F. Paul Ronca was recently elected chairman of the technical committee of the Abrasive Grain Association. Mr. Ronca is manager of the silicon carbide product engineering department, The Carborundum Co., Niagara Falls, N. Y.

* * *

Dr. and Mrs. Ernest Wiener (Special Welding Alloy Co., Inc., Long Island City, N. Y.) recently took a vacation in Europe. They had the good fortune to be in Geneva, Switzerland, in time for the international atomic energy conference held there.

* * *

B. T. duPont has been appointed general manager, and *C. E. Hanson* has been named sales manager of the Plastic Metals Div., National U. S. Radiator Corp., Johnstown, Pa. The division manufactures metal powders used in electrodes.

* * *

John A. Gilroy has been appointed plant engineer at the Harnischfeger Corp.'s main plant in Milwaukee. Mr. Gilroy succeeds *William Hitzelberger* who recently retired.

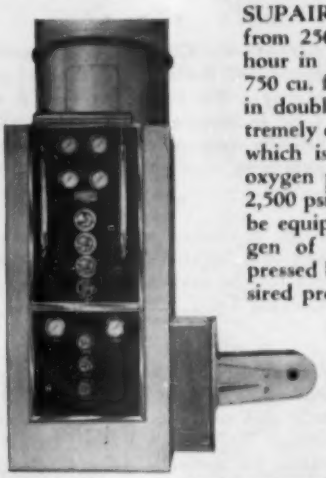
* * *

R. B. (Bob) Roberts has joined National Electronics, Inc., Geneva, Ill., as sales manager. Mr. Roberts was formerly manager of equipment manufacturer sales for the Westinghouse tube division, Westinghouse Electric Corp.

* * *

Frank A. Weeks, Jr. has been named sales manager for the new electronic tube sales district of General Electric Co., Schenectady, N. Y. The territory covers most of Indiana and part of Kentucky. Mr. Weeks will service distributors handling receiving, industrial, transmitting and cathode ray tubes and other electronic equipment sold through the Tube Department. His office is in the Guaranty Bldg., Indianapolis. *W. Hayes Clarke* has been appointed national accounts sales manager, and *F. H. O'Kelley, Jr.*, eastern regional sales manager of the Tube Dept.

Make OXYGEN from air economically and efficiently with a SUPAIRCO plant



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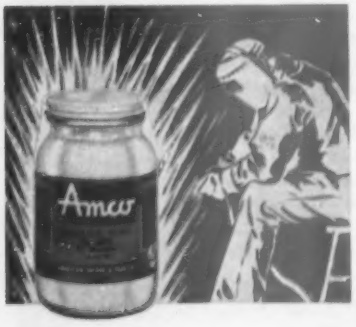

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Hugh J. McKane has been promoted to the newly created position of southern area district manager for the Bay State Abrasive Products Co., Westboro, Mass. Mr. McKane joined Bay State in 1948 after being associated for 14 years with The Carborundum Co., Niagara Falls, N. Y.

* * *

Barron W. Chandler was recently appointed Indianapolis district sales manager for P. R. Mallory & Co., Inc., Indianapolis. He was formerly sales representative in the Philadelphia area.

* * *

John A. Zura has been appointed sectional service engineering manager for the midwest area of Adamas Carbide Corp., Kenilworth, N. J.

* * *

Edward J. Richardson has been named manager of the tubular products and cold finished bar division, Joseph T. Ryerson & Son, Inc., Chicago. He succeeds *Allen P. Beckloff* who has been appointed manager of the Boston steel service plant.

* * *

Edgar W. Engle has joined the technical staff of Fansteel Metallurgical Corp., North Chicago, Ill., as assistant to the technical director.

* * *

John C. Mullarkey has been named technical service representative in Phoenix, Ariz., by Oakite Products, Inc., New York City.

* * *

John P. Walsh has been appointed sales engineer for "Pyrotone" welding backing rings by General Ceramics Corp., Keasbey, N. J. Mr. Walsh was formerly with the Foster-Wheeler Corp.

* * *

George A. Waterman has been named extrusion manager for Kaiser Aluminum & Chemical Sales, Inc. Chicago, a component of Kaiser Aluminum & Chemical Corp., Oakland, Calif. He succeeds *W. B. Thomas* who has been named manager of the newly created order division. Mr. Waterman previously was assistant manager of the Midwest division of Revere Copper & Brass before joining Kaiser Aluminum.

* * *

Edward F. Harrington has joined the staff of the sales development department of Tube Turns, Louisville, Ky. Mr. Harrington became associated with Tube Turns in 1954 in the product engineering and research department.

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The Research & Control Instruments Div., North American Philips Co., Inc., Mount Vernon, N. Y., has announced the appointment of *Philip I. Wolf* as resident sales and application engineer for the western part of the United States, with offices at Burlingame, Calif.

* * *

Dr. Wen Hsiang Chang, formerly of Hunan, China, has joined the Materials & Processes Laboratory, General Electric Co., Schenectady, N. Y., as an applied research engineer. He is a member of the American Welding Society.

* * *

Electric Steel Foundry Co., Portland, Ore., recently named *Harold M. Gowing* manager of public relations. He will be located in Portland.

* * *

Herbert J. Scott has been named construction specialist in the Chicago area for the Nelson Stud Welding Div., Gregory Industries, Inc., Lorain, Ohio.

* * *

Robert E. Roediger has been appointed district representative for territorial development in Alabama, Mississippi, Arkansas and Louisiana for Hobart Bros. Co., Troy, Ohio. Mr. Roediger will supervise cooperative distributor operations in sales of arc welding equipment, supplies and electrodes. He will be located in Birmingham.

* * *

Harry J. Higgins has been appointed sales manager for Portland Copper & Tank Works, Inc., South Portland, Maine. The firm manufactures stainless steel and super alloys.

* * *

Died . . .

A. E. (Al) Ziesel, president of Perma-Latem Welding Alloys, Inc., Red Bank, N. J., died Aug. 14.

* * *

Howard E. Johnson, Sr., chief engineer, American Manganese Steel Division, American Brake Shoe Co., Chicago Heights, Ill., died recently. He was 53.

* * *

George William Lucas, supervisor of carbide materials and process engineering, Carboloy Department of General Electric Co., Detroit, died suddenly at the age of 46. Mr. Lucas was a pioneer in the development of cemented carbide metals. He was one of the first members of the organization in Cleveland when it was known as Carboloy Co., Inc.

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Select the Correct
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CAST IRON WELDING RODS
OR ELECTRODES

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FUSE-WELL No. 11, Square—Gray Cast Iron Welding Rod for Acetylene use in filling or building up new or worn castings producing machineable welds.

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FUSE-WELL No. 14, Moly—An Iron Base Rod with alloys added for finer grain structure and greater strength.

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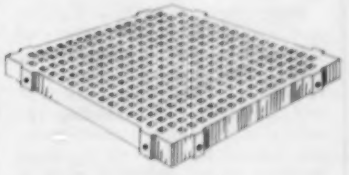

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WELDING CLAMPS
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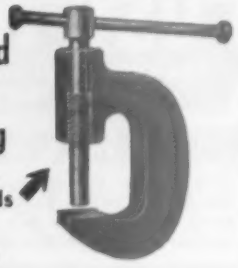
No Threads To Damage



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3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

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High efficiency (85% or higher) and power factor (90%-plus) of GLENN welders is a big advantage in field welding. Input power is half that of reactive welders of comparable rating. Welding capacity of the same power source can thus be doubled—or the same welding ouput achieved with a much smaller portable generator.

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51. WELDING MACHINES — Morton Mfg. Co. Bulletin 43 contains illustrations and descriptions of models of girth welding machines.

52. ELECTRODE—The Champion Rivet Co. Illustrated booklet describes manufacture of electrodes, explaining the process from start to finish.

53. PLASTIC PIPE—Alpha Plastics, Inc. 12-page illustrated catalog explains how to use and choose rigid plastic pipe and fittings. Price lists and a corrosion chart are included.

54. WET-BLAST CLEANING — Wheelabrator Corp. Vol. 1, No. 2 of new publication, "Wet Blast Cleaning & Finishing News," describes various uses in actual practice of wet blasting.

55. WELDOR'S GOGGLES—Glendale Optical Co., Inc. 4-page, illustrated folder gives specifications for, and descriptions of, weldor's goggles.

56. PLASTIC WELDING — American Agile Corp. Illustrated catalog describes available plastic equipment, including thermoplastic welding rod, and an explanation of the plastic-welding process.

57. CYLINDER TRUCKS—Weldrite Co., Inc. Folder discusses types of gas cylinder trucks available.

58. HARDFACING ALLOYS—Coast Metals, Inc. Folder describes series of nickel-base alloys for use in hardfacing and high-temperature brazing.

59. INDUSTRIAL X-RAY—Balteau Electric Corp. Sheet describes and illustrates "Baltograph 120" industrial X-ray unit.

60. INDUCTION HEATING — Lindberg Engineering Co. Bulletin No. 1441 describes, with illustrations, induction-heating units and their uses.

61. WELDING GUIDE—Sylvania Electric Products, Inc. "Inert Gas Arc Welding Guide" contains three charts to aid in welding aluminum, magnesium and stainless steel.

62. TEMPLATES—Rankin Mfg. Co. Form A-7 contains cardboard templates for measuring wear on tractors and determining need for hardfacing.

63. ELECTRODES—Tipaloy, Inc. 24-page illustrated catalog lists electrodes, rod and bar stock, seam welding wheels, etc., with application data on resistance welding.

64. STAINLESS STEEL—The Babcock & Wilcox Co. Data card TDC-178 gives stress rupture properties of chromium-nickel, stainless-steel weld deposits.

65. ALUMINUM CABLE — Tweco Products Co. Lightweight aluminum welding cable called "Tweco-lite" is subject of descriptive sheet.

66. BENCH WELDERS—Thomson Electric Welder Co. Bulletin 325A describes models of spot and projection bench welders for production work.

67. VACUUM-MELTED ALLOYS—Vacuum Metals Corp. Sheet describes advantages of using vacuum-melted alloys in a wide variety of aircraft applications.

68. HARD CARBIDE BRAZING — The American Platinum Works. Bulletin 542 discusses the use of silver brazing for joining of carbide tips.

69. TURNING ROLLS—Aronson Machine Co. 4-page folder illustrates and describes turning rolls designed for production and precision welding.

70. PROPANE TORCH—Velocity Power Tool Co. Sheet discusses propane "Torch-O-Matic" torch for soldering, brazing, burning, etc.

71. TANK WELDING—Cayuga Machine & Fabricating Co., Inc. Bulletin 5304 describes the horn jig for automatic welding of tanks.

72. GRINDER—J & H Products Co. Catalog sheet (Form 215) gives specifications for the model "P" heavy-duty grinder designed for industrial use.

73. TIG, MIG WELDING—The Liquid Carbonic Corp. Folder "CO_2 takes the high cost out of Tig and Mig welding" describes advantages of carbon dioxide.

74. WELDOR'S CLAMPS—Bernard Welding Equipment Co. Catalog sheet details the "Pro-clamp" welding clamp.

75. AUTOMATIC CONTROL—Automatic Temperature Control Co., Inc. Bulletin No. S-10 treats automatic control of processes and machines, including automatic welding controls.

76. WELDING DATA—General Electric Co. "New techniques in inert-gas shielded metal-arc welding" is an illustrated treatment of new methods using carbon dioxide.

77. LITHIUM—Foote Mineral Co. *Foote Prints* (Vol. 27, No. 1) contains information on uses of lithium with a bibliography of welding articles.

78. RESISTANCE WELDER—Sciaky Bros., Inc. Bulletin 334-3 illustrates and describes the "PMCO 2 ST" air-operated, press-type spot welder for heavy industrial use.

79. CUTTING TORCH—Buckle Flame Cutter Co., Ltd. Folder describes the "Buckle" oxygen cutting torch designed to hold down gas consumption.

80. COPPER BRAZING—Superweld Corp. 4-page specification describes requirements and procedures for furnace copper brazing.

81. STEEL DESIGN—Alloy Metal Wire Co. 40-page "Design Handbook" covers properties, specifications, applications and design data on 20 grades of stainless steel wire, rod and strip.

82. WELDOR'S GLOVES—Advance Glove Mfg. Co. 4-page price list gives types and descriptions of work gloves available.

83. FLUX—All-State Welding Alloys Co., Inc. Pocket-size, 32-page booklet condenses into ready reference form data necessary to choose proper alloys and fluxes.

84. GRINDERS—Master Pneumatic Tool Co., Inc. Bulletin 1030A describes, with illustrations, grinders, sanders, buffers and wire brushes and their uses.

85. ELECTRODE—C. E. Phillips & Co. Folder describes the "600" improved copper-nickel-alloy electrode designed for welding cast iron. Illustrations of welds are included.

86. SWITCHES—Automatic Electric Sales Corp. Circular 1843 describes stepping switches, relays, key switches and other automatic controls.

ad literature

91. Adjustable Clamp Co.—32-page clamp catalog available.

92. Air Reduction Sales Co.—Catalog ADC 853 on repetitive shape-cutting machine.

93. Alloy Ring Service, Inc.—Information on brazing rings, preformed shapes, silver alloy, copper, soft solder and flux.

94. Alloy Rods Co.—Story of all-position iron powder low-hydrogen electrode.

95. All-State Welding Alloys Co., Inc.—Guide book for solution of welding, brazing, soldering, cutting and tinning problems available.

96. Aluminum Co. of America—176-page book, "Welding Alcoa Aluminum."

97. American Platinum Works—Guide to successful silver brazing available.

98. Ampco Metal, Inc.—Bulletin on resistance welding electrodes and accessories.

99. Arcair Torch—Carbon-graphite electrodes and test data available.

100. Becker Bros. Carbon Co.—Catalog gives specifications, scaled drawings, etc., on carbon welder brushes.

101. Cam-Lok, Div. of Empire Prods.—Bulletin 121 describes cable connectors and electrode holders.

102. Carborundum Co. — Booklet on "MX" abrasive products.

103. Carborundum Co.—Brochure gives information on depressed center grinding wheels.

104. Carol Cable Co.—Information on "Dynapower" welding cable.

105. Contour Marker Corp.—Information on contour-marking devices.

106. Drawalloy Corp.—Information and prices on stainless steel welding wire.

107 Eisler Engineering Co., Inc.—Data on spot welders and general welding equipment.

108. Eutectic Welding Alloys Corp.—

(Continued on page 116)

WELDING INFO-AIDS

USE THIS CARD for Literature, Catalogs, and Bulletins shown on facing page, and for those featured in this month's ads as listed on next page

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Welding Info-Aids

Welding Engineer

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Chicago 11, Ill.

ad literature

New DirectoRod Guide and welding rods and electrodes available.

109. General Electric Co.—Bulletin GEC-1334 on CO_2 automatic welding system.

110. Glenn Co.—Data and prices on constant voltage welders.

111. Goldsmith Bros. Smelting & Refining Co.—Data book on low temperature silver brazing available.

112. H & M Pipe Beveling Machine Co.—Folder, "More Profit Dollars in Pipe Fabrication."

113. Handy & Harman—Bulletin 20 tells story of "Easy-Flo" and "Sil-Fos" silver brazing alloys.

114. Harnischfeger Corp. — Information on constant voltage welders for solving automatic welding problems.

115. Harrisburg Steel Corp.—Literature on seamless steel high pressure gas cylinders.

116. Harris Calorific Co.—Folder No. 540710 describes torch for intense heat requirements.

117. Hobart Bros. Co.—Details on electric and gas drive welders.

118. Hobart Bros. Co.—Complete electrode catalog available.

119. Hobart Bros. Co.—Information on rectifier and transformer welders.

120. Hossfeld Mfg. Co.—Bulletin shows bender models, dies and bar, angle iron and pipe bends.

121. Industriline Inc.—Bulletins on portable kit for insulating cable connectors.

122. International Nickel Co., Inc.—"Welding Bulletin, T-2" contains general welding information.

123. K-G Equipment Co. (Inc.)—Bulletin gives information on single and two-stage compressed gas regulators.

124. Kasson Die & Motor Corp.—Folder and details on portable arc welder with first toroidal transformer.

125. Krembs & Co.—Chart and fluxine sample available.

126 Lincoln Electric Co.—Bulletin 1355 gives facts on automatic welders and power sources for submerged-arc welding.

127. Machinery & Welder Corp.—Details and prices on x-ray unit for spot checking welds.

128. Mallory & Co., P. R.—Technical data on cold-formed electrodes available.

129. Metal Bond Mfg. Co.—Pocket-size catalog contains information on soldering and welding products.

130. Metal & Thermit Corp.—Catalog contains information on arc welding accessories.

131. Mid-States Welder Mfg. Co.—Literature and details on a-c and d-c industrial welders.

132. Miller Electric Mfg. Co., Inc.—Information on rectifier type d-c arc welders.

133. Miller Electric Mfg. Co.—Data on welders for tungsten arc welding process.

134. Miller Electric Mfg. Co.—Information on "Multi-Arc" combination a-c/d-c welder.

135. Miller Electric Mfg. Co.—Data on "100 Series" heavy duty industrial type a-c welders.

136. Norris-Thermador Corp.—Specifications on all sizes of acetylene cylinders.

137. North American Philips Co., Inc.—Folder on tungsten electrode welding.

138. Norton Co.—Information on grinding wheels for heavy jobs.

139. Page Steel & Wire Div.—Folder DH-402 sets forth analyses of automatic welding wire.

140. Pandjiris Weldment Co.—New catalog 8155 presents complete line of standard and special production welding equipment.

141. Phoenix Products Co.—Details on electrode ovens.

142. A. O. Smith Corp.—Details on "SW-44" iron powder electrode.

143. A. O. Smith Corp.—Catalog containing information on more than 70 electrode classifications.

144. Smith Welding Equipment Corp.—Information on "Silver Star" cutting torch.

145. Stahl Equipment Co.—Details on welding and set-up platens.

146. Stoody Co.—Literature on semi-automatic hard-facing with alloy tubular wires for earth-working and crushing operations.

147. Superior Air Prods. Co.—Catalog gives details on single and double rectification type oxygen plants.

148. Tempil Corp.—Sample temperature pellets available.

149. Tube Turns—Bulletin on "Pipe Fittings Material."

150. Tweco Products Co.—Data and prices on complete line of electrode holders, ground clamps and cable connections.

151. Unique Turn Table & Equipment Co.—Catalogue 54B describes positioners, idlers and turning rolls.

152. U. S. Steel—Booklet contains story of "T-1" steel.

153. United Wire & Supply Corp.—Booklet describes brazing alloys and fluxes.

154. Vickers Electric Div.—Bulletin on magnetic amplifier-rectifier d-c welder.

155. Victor Equipment Co.—Manual and descriptive leaflets on coated high-alloy and other welding rods.

156. Weltronic Co.—Brochure on new welding control.

157. Weltronic Co.—Folder on inert-gas welding control.

158. Weltronic Co.—*Weltimer Magazine* available.

159. Worthington Corp.—New bulletin R-1700-B15 shows how to choose a positioner.

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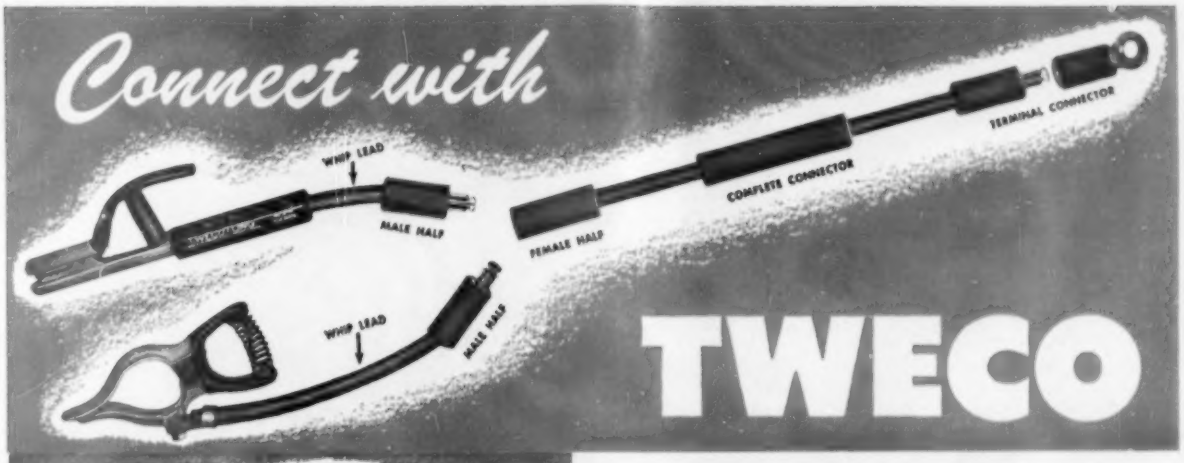

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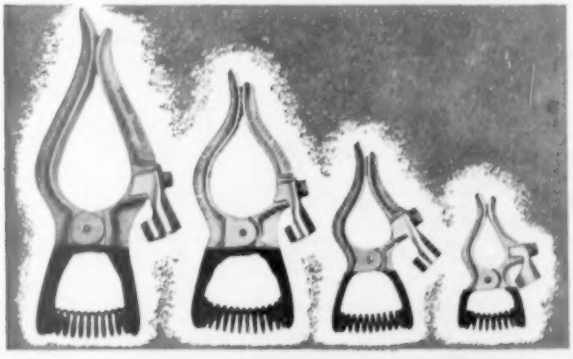

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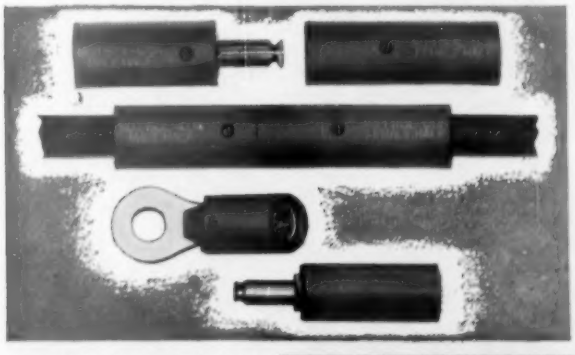

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